

Fm 55-42

29 June 1979

FM55-42

Reference

# ARMY AVIATION INTERMEDIATE MAINTENANCE

SP by Fm 1-500  
4 April 1985  
unclassified/limited/USG  
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en Army studies



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# ARMY AVIATION INTERMEDIATE MAINTENANCE

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\*This manual supersedes FM 29-36, 12 June 1972; and TM 55-416, 9 February 1968, including all changes.

## MECHANIC'S CREED

ON MY HONOR I SWEAR THAT I SHALL HOLD IN SACRED TRUST THE RIGHTS AND PRIVILEGES CONFERRED UPON ME AS A QUALIFIED MECHANIC. KNOWING FULL WELL THAT THE SAFETY AND LIVES OF OTHERS DEPEND ON MY SKILL AND JUDGMENT, I SHALL NEVER KNOWINGLY SUBJECT OTHERS TO RISKS WHICH I WOULD NOT BE WILLING TO ASSUME FOR MYSELF OR FOR THOSE DEAR TO ME.

IN DISCHARGING THIS TRUST, I PLEDGE MYSELF NEVER TO UNDERTAKE WORK OR APPROVE WORK WHICH I FEEL TO BE BEYOND THE LIMITS OF MY KNOWLEDGE; NOR SHALL I ALLOW ANY NONQUALIFIED SUPERIOR TO PERSUADE ME TO APPROVE AIRCRAFT OR EQUIPMENT AS AIRWORTHY AGAINST MY BETTER JUDGMENT; NOR SHALL I PERMIT MY JUDGMENT TO BE INFLUENCED BY PERSONAL GAIN; NOR SHALL I PASS AS AIRWORTHY AIRCRAFT OR EQUIPMENT ABOUT WHICH I AM IN DOUBT, EITHER AS A RESULT OF DIRECT INSPECTION OR UNCERTAINTY REGARDING THE ABILITY OF OTHERS WHO HAVE WORKED ON IT TO ACCOMPLISH THEIR WORK SATISFACTORILY.

I REALIZE THE GRAVE RESPONSIBILITY WHICH IS MINE AS A PROFESSIONAL MAINTENANCE TECHNICIAN TO EXERCISE MY JUDGMENT ON THE AIRWORTHINESS OF AIRCRAFT AND EQUIPMENT. I, THEREFORE, PLEDGE UNYIELDING ADHERENCE TO THESE PRECEPTS FOR THE ADVANCEMENT OF AVIATION AND FOR THE DIGNITY OF MY VOCATION.

# ARMY AVIATION INTERMEDIATE MAINTENANCE

## PREFACE

The concept of three-level aviation maintenance in the Army was developed through necessity to support flying mission requirements under combat conditions. The three levels are identified as follows:

- **Aviation Unit Maintenance (AVUM).** AVUM is the responsibility of, and performed by, an operational unit. It must be noted that unit maintenance of assigned aircraft is in addition to the performance of missions for which the unit was organized. At this level of aviation maintenance, the capability to perform component maintenance in the allied trades (engine, hydraulic, power train, airframe, electrical, and propeller and rotor) is a part of the operational unit. AVUM is discussed in FM 55-41.
- **Aviation Intermediate Maintenance (AVIM).** AVIM is a single level of support maintenance between the unit and depot levels of maintenance. Only aircraft **maintenance** units are at AVIM level.
- **Depot Maintenance.** Depots overhaul, perform major repairs, modify, and completely paint aircraft using assembly line techniques. Depot maintenance includes performance of tests and inspections in support of national inventory control point (NICP) requirements and national maintenance point (NMP) standards.

This manual sets forth the basic concepts about AVIM. It describes the aircraft maintenance support system in the combat and communications zones. The manual also identifies units used to provide this support and provides broad guidance in maintenance management.

The US Army Transportation School (USATSCH) is the proponent for this publication. Recommended changes and comments for its improvement are requested. Prepare comments and recommended changes on DA Form 2028 and forward to Commandant, US Army Transportation School, ATTN: ATSP-CD-CS, Fort Eustis, VA 23604.

This field manual has been reviewed for the use of neutral language. Unless otherwise noted, the words "he," "him," and "men" will be understood to stand for both masculine and feminine genders.



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## CHAPTER 1

# AVIATION INTERMEDIATE MAINTENANCE (AVIM) COMPANY: ITS MISSION, USE, PERSONNEL, AND STRUCTURE

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The transportation aircraft maintenance intermediate support company is designed to provide intermediate support for all Army aircraft. Nondivisional AVIM units are organized under Table of Organization and Equipment (TOE) 55-459H. They may be augmented in a variety of ways, depending on the unit's individual mission. Divisional AVIM units are aircraft maintenance companies organic to the armor, mechanized, airborne, and infantry divisions and the aircraft maintenance battalion of the airmobile division. They perform intermediate level aircraft maintenance functions (this explains the term "divisional" AVIM). This chapter describes the following aspects of an AVIM unit:

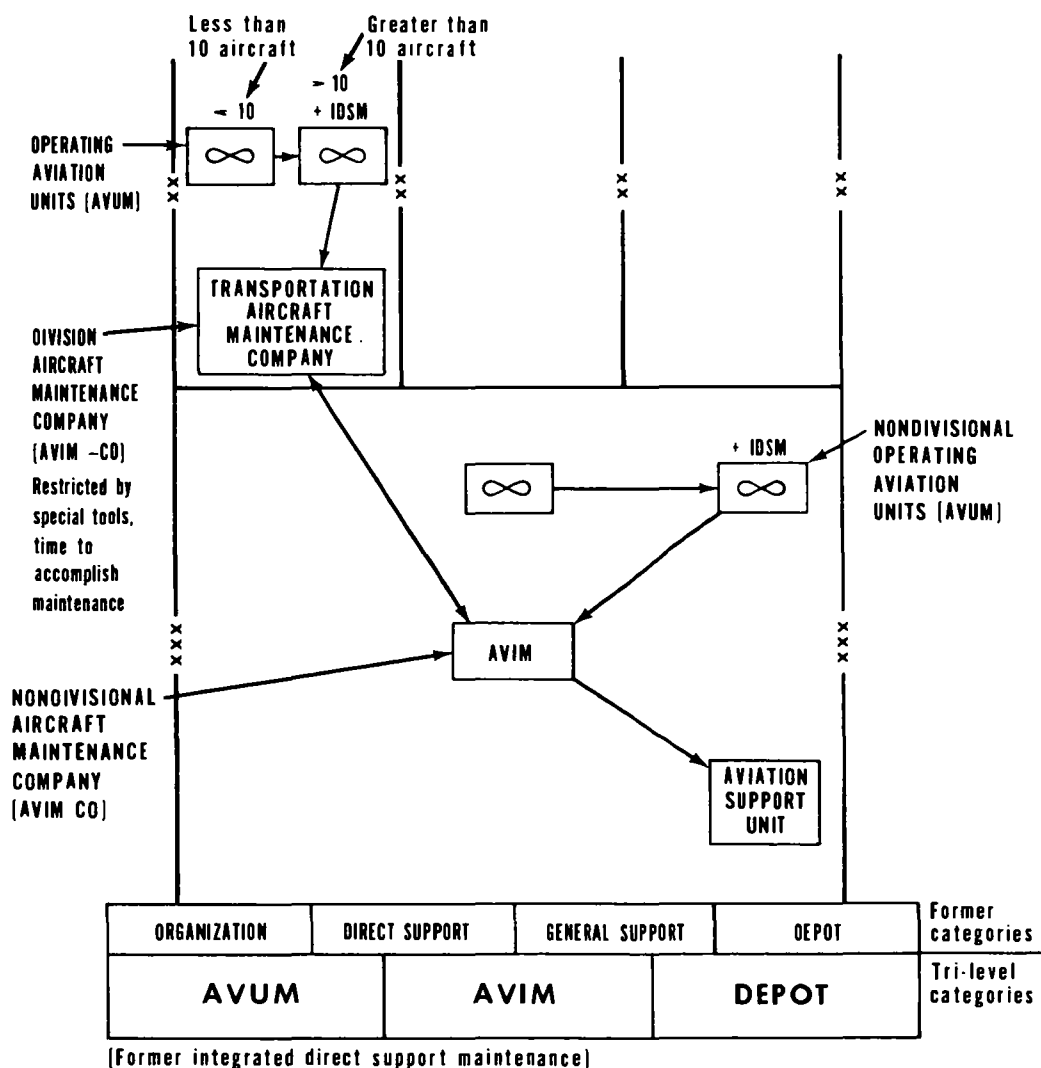
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## ASSIGNMENT

Nondivisional AVIM is assigned to the corps support command (COSCOM) or theater army area command (TAACOM). If aircraft density in the corps area requires more than one AVIM, a battalion may be formed under TOE 55-456. Divisional AVIM is assigned to the appropriate division and is organic to an aviation battalion. Allocation of units depends on the number of aircraft assigned to the supported area. The following figure depicts the maintenance concept for Army aircraft.

### MAINTENANCE CONCEPT FOR ARMY AIRCRAFT





## MISSION

The AVIM company provides mobile, responsive maintenance support to its customers. The ultimate objective is to have a maximum number of flyable aircraft to support the combat forces. To accomplish this maintenance mission, the AVIM company is responsible for carrying out a number of tasks under varying conditions. They are as follows:

- Repair equipment (aircraft, aircraft armament, avionics, and aircraft peculiar items of ground support equipment) for return to user.
- Repair certain components and parts for return to supply stocks in support of the direct exchange (DX) program.
- Operate a shop supply element in support of its organic maintenance effort.
- Operate a DX and limited cannibalization point.
- Perform weight and balance and other special inspections for supported units.
- Provide aircraft recovery and air evacuation and technical assistance through mobile maintenance contact teams. (See FM 55-413 for guidance in recovering aircraft and appendix E, this manual, for sample standing operating procedures (SOP).)
- Provide "C" level calibration and repair support for test and diagnostic equipment.
- Provide backup support to divisional AVIM units.
- Maintain collection and forwarding points as part of the Army oil analysis program (AOAP).

**NOTE:** Divisional AVIM's have less equipment assigned than non-divisional AVIM's and these tasks will be reduced accordingly. Each nondivisional TOE must be reviewed to determine the unit's assigned tasks.

## USE

The nondivisional AVIM is normally employed on an area basis, supporting nondivisional units within a corps area, or in a specified portion of the communications zone (COMMZ). Individual maintenance and repair parts requests are received directly from the supported aviation units. Cross-leveling workloads from other aircraft maintenance intermediate support units are received from an aircraft maintenance battalion. Overflow workloads from other battalions or from divisional aircraft maintenance units are received from the controlling materiel management center (MMC) through the battalion headquarters. Divisional AVIM companies support divisional units within the divisional area. Requests by divisional AVIM's for maintenance or supply assistance from nondivisional AVIM's are submitted through the division materiel management center (DMMC). AVIM units are designed to operate from a semifixed location, using mobile contact teams for onsite maintenance.

## PERSONNEL

In any organization there exists a variety of duties and responsibilities. AVIM units are no exception.

### COMMANDER

A commander has the following basic responsibilities for accomplishing unit maintenance:

- Insuring sufficient time for performance of necessary maintenance.
- Insuring proper distribution and utilization of assigned maintenance personnel according to military occupational specialty (MOS).
- Providing training time.
- Insuring availability of necessary publications.
- Conducting inspections.
- Establishing awards for outstanding performance.
- Correcting substandard work.

- Considering maintenance requirements when preparing tactical, operational, and training plans.
- Keeping maintenance SOP's up to date and insuring their conformance to published DA maintenance doctrine.
- Making certain that procedures are understood for contacting and working with support units.
- Providing the support activity with a density list of equipment to be supported.
- Providing the support activity with copies of approved prescribed load lists (PLL).

### **PLATOON LEADERS AND SECTION LEADERS**

The following responsibilities are applicable to platoon and section leaders:

- Assigning a qualified operator or responsible individual at all times for each piece of equipment.
- Scheduling and documenting on-the-job training (OJT), cross-training, and school training.
- Performing scheduled maintenance on all assigned equipment.
- Insuring that authorized repair parts and maintenance supplies are on hand or on valid requisition, and that outstanding supply requests are followed up promptly and in accordance with AR 710-2.
- Requesting assistance from support unit when required.
- Using personnel according to their MOS.
- Scheduling personnel for additional training at service schools.
- Planning, supervising, and managing the unit maintenance program.
- Providing up-to-date signature cards, DA Form 1687, to supporting activities, listing personnel authorized to sign for supplies and equipment.

- Insuring proper and constant use of technical publications.
- Conducting OJT and cross-training of subordinates.
- Distributing work equitably.
- Insuring that the individual designated as the operator or user for each item of equipment is properly licensed and performs operator or user maintenance.
- Insuring safe transport of equipment to or from the supporting maintenance activity.

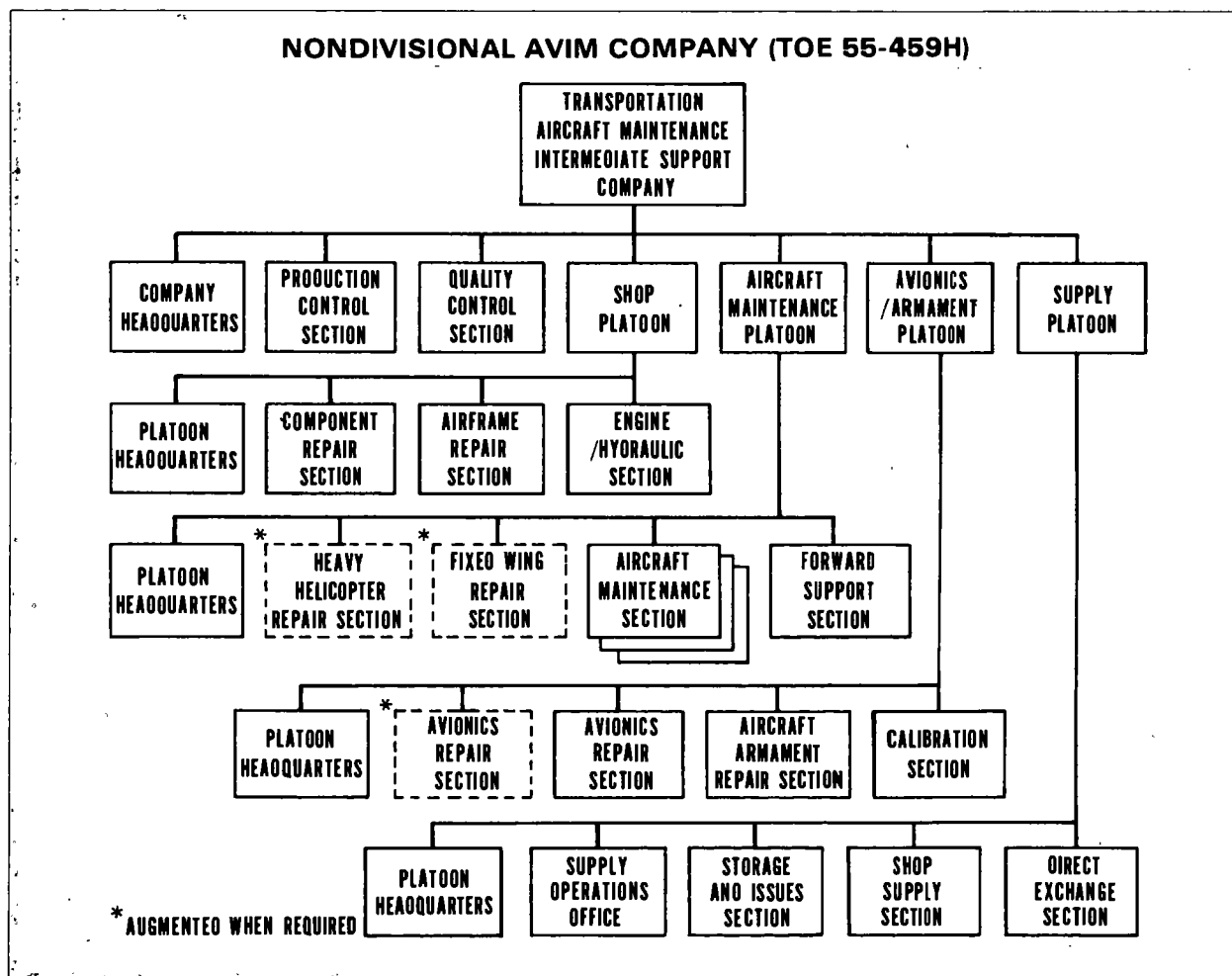
## OPERATORS AND CREWMEMBERS

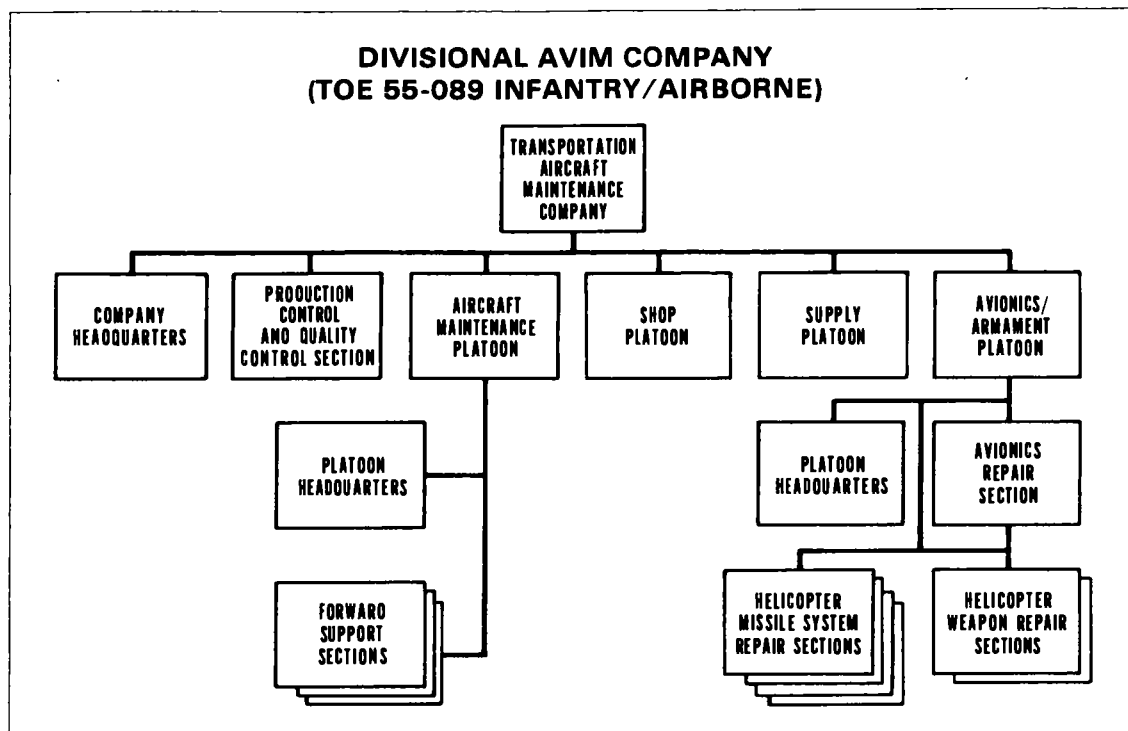
Operators and crewmembers have the following responsibilities:

- Using equipment properly.
- Keeping equipment clean, presentable, safe, and operable.
- Reporting any malfunction that may develop that is beyond their capability or authorization to correct.
- Making proper entries on equipment records for which they are responsible, as required by TM 38-750.

## ORGANIZATION

The nondivisional AVIM, TOE 55-459H, is organized as shown below. For an example of a divisional AVIM, see the organizational chart on the next page.





Functions of the various company elements, divisional and nondivisional are as follows:

### COMPANY HEADQUARTERS

Company headquarters provides the usual command, supply, administrative, dining, and organizational maintenance functions (less communication and aircraft dated equipment).

### SUPPLY PLATOON

The supply platoon is responsible for technical supply and aircraft repair parts and associated hardware and bulk material. The platoon is divided into the platoon headquarters, supply operations office, storage and issue shop supply section, and the DX section. Functions of the supply platoon include:

- Providing aircraft repair parts for supported units.
- Editing, proofreading, and posting the daily supply control printout received from the MMC.
- Providing informal supply accounting for equipment and parts processed through the collection and classification

point, the cannibalization yard, items being repaired for the DX program and for items stored by elements of the unit as operational readiness floats. These items are normally not assigned to the AVIM units' property books. However, they must be accounted for; thus the term informal accounting.

- Preparing the automatic data processing (ADP) cards used in the mechanized supply request and accounting system.
- Receiving, inspecting, storing, and issuing all repair parts, components, assemblies, and aircraft special tools required to support the company maintenance and technical supply mission.
- Maintaining demand supported shop stocks and providing bench and service stock.
- Providing direct exchange of selected unserviceable reparable parts, components, assemblies, and minor secondary items.
- Operating the cannibalization point.

The greatest hindrance to unit mobility is the storage requirement for approximately 7,000 line items of the authorized stockage list. Experience shows that as many as twenty-seven 8- x 8- x 20-foot containers (if that means is chosen) are needed to move the repair parts normally stocked by the platoon.

### **QUALITY CONTROL SECTION**

This section detects deficiencies in repair, overhaul, modification, and other maintenance functions concerning Army aviation. The procedures employed by this section are designed to insure maximum effectiveness with an acceptable level of quality. To insure complete objectivity and preclude any conflict of interest, the quality control section is responsible directly to the company commander.

### **PRODUCTION CONTROL SECTION**

This section establishes formal procedures through coordination to assure efficient use of maintenance mission resources. This section receives and processes work requests, coordinates and schedules jobs through various shops, maintains aircraft parts status boards and shop status reports. It also coordinates inspection and test flight requirements and the return of repaired aircraft and equipment to the supported unit.

### **SHOP PLATOON**

The shop platoon is responsible for component, airframe, and engine or hydraulic repairs. Assigned to this platoon are instrument repairmen, aircraft electricians, and power train and rotor repairmen. Assigned also are machinists, welders, sheet metal workers, and fiberglass, plastic, and paint personnel. The repair work in all of the sections is in support of both the user and the supply system. Much of the potential workload of the shop platoon will be aircraft reparable parts of the DX program.

### **AVIONICS/ARMAMENT PLATOON**

The avionics repair section performs intermediate level maintenance on all avionics equipment and subsystems installed on Army aircraft. Also it performs maintenance on certain items of ground equipment such as flight coordination centers and ground ap-

proach radar sets. Requirements peculiar to CH-54 helicopters, fixed-wing aircraft, and OV-1 surveillance equipment have been placed in augmentation. The armament repair section performs intermediate level maintenance on all weapons, armament systems and subsystems, and fire control subsystems and components installed on Army aircraft. The fire control repairmen work primarily on optical and electrical/electronic components.

The calibration section is new to the intermediate level of aviation support maintenance. It has been placed in the avionics/armament platoon of the non-divisional AVIM company. It provides "C" level calibration service of test, measurement, and diagnostic equipment used by other elements of the AVIM company and by supported units. It is also capable of performing repair on electronic devices which are tagged unserviceable by calibration specialists.

### **AIRCRAFT MAINTENANCE PLATOON**

The aircraft maintenance platoon performs intermediate level maintenance on major end items (helicopter or airplane) at a semifixed support base. It also dispatches mobile contact teams to supported unit locations or downed aircraft sites. The contact teams are tailored for each maintenance, recovery, or inspection requirement using resources of the platoon plus augmentation from the allied shops or the quality control or supply element.

Under the aircraft maintenance platoon are three maintenance sections which combine the former missions of the three direct support (DS) sections and the two general support (GS) sections under the old four-category system. The sections may be structured by the commander to meet requirements of the unit.

## **SUMMARY**

Let's review some important points from this chapter:

- Nondivisional AVIM units are assigned to corps support or theater army area command; divisional AVIM units are assigned to appropriate divisions.
- The AVIM company mission is to perform a variety of tasks to provide maintenance support to its customers.
- Nondivisional AVIM units are employed on an area basis supporting nondivisional units within a corps area, or in a specified portion of the COMMZ.
- AVIM units are organized into headquarters element, supply platoon, quality control section, production control section, shop platoon, avionics/armament platoon, and an aircraft maintenance platoon.

## CHAPTER 2

## MAINTENANCE MANAGEMENT

Army aviation increases the capability of the Army to conduct effective combat operations. But to do this, Army aircraft require considerable maintenance. And this maintenance requires sophisticated electronic equipment and precise measuring instruments. All of these elements of aircraft maintenance need technically trained personnel who have the capability to manage the Army aviation intermediate maintenance program. One way of stating the importance of aircraft maintenance and management is to show a relationship. For example, management is to maintenance what maintenance is to flying. It is this thought that forms the backdrop for the contents of this chapter.

The topics discussed in this chapter are as follows:

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## A MAINTENANCE CONCEPT

A maintenance concept is an expression of categories and techniques of maintenance to support each end item. A maintenance support plan is developed for each new item of equipment. It is made a part of the required operational capability (ROC) document. A ROC is a Department of the Army approved statement of a military need for a new item believed feasible to develop. The concept is reflected in the maintenance specifications (often referred to as "specs") and the design of the item. It provides for the necessary support of all Army materiel from user level through the several categories of maintenance. Definite requirements for maintenance of an item are kept in mind in all stages of development. Examples of these requirements are:

- Reliability, availability, maintainability (RAM).
- Frequency of scheduled maintenance actions.
- Test and checkout methods.
- Time between overhaul (TBO).
- Maintenance man-hours per operating hour.

## MAINTENANCE OBJECTIVE

The primary objective of maintenance is to keep Army materiel ready for use in performing its mission and to do it as economically as possible. Achieving this objective requires action at planning and supervisory levels and at maintenance operation levels. Some typical examples follow:

### PLANNING AND SUPERVISORY LEVELS

Maintenance requirements for an aircraft are identified and established in the ROC. During development of an aircraft, its operation and maintenance are planned to conform to the various skill levels. In-process reviews (IPR's) take place during development to make sure that the maintenance concept given in the ROC is followed. Standardized repair parts are used as much as possible, and a definite maintenance support plan is established. This includes maintenance at

the lowest category that can do the work as well as enough men, equipment, tools, and publications to get the work done.

## MAINTENANCE OPERATION

At the level where the maintenance is done, the foremost action is to predict, prevent, detect, and correct possible failures before they happen. This is done by preventive maintenance services and inspections. All types of equipment should be kept ready for use. When supported units increase their operations, the supporting unit should plan a corresponding increase in its support. Always, equipment should be made serviceable with the least possible man-hours, money, and material.

## MAINTENANCE POLICIES

Throughout the history of Army maintenance, policies have evolved to assure support for each item of equipment. Maintenance operations are assigned to specific levels of command according to the primary mission, characteristics, and mobility of the level involved, and the economical distribution of resources. The following policies are general and apply to all aircraft maintenance rather than to any specific operation.

- Maintenance is performed according to published maintenance doctrine at the lowest category consistent with the tactical situation, skills, time, repair parts, tools, and test equipment available within allocations.
- Repairs are accomplished onsite wherever possible, and in accordance with maintenance allocation charts (MAC).
- Unserviceable materiel beyond the maintenance authority or capability of an organization is reported or delivered to the next higher maintenance organization promptly.
- All authorized maintenance within the capability of an organization is accomplished, if possible, before evacuation of economically repairable items to the next higher category of maintenance.



- Controlled cannibalization is used as a means of obtaining repair parts and assemblies to support maintenance of equipment.
- The assignment of a maintenance function will not be thought of as the authority to carry the associated repair parts in stock. The authority to requisition, stock, or otherwise secure the necessary repair parts and special tools list (RPSTL) is in accordance with AR 710-2.
- Aircraft maintenance activities at all categories will be oriented to the early detection of faults that affect safety of flight. Diagnostic/fault isolation, go-no-go equipment will be used to the maximum extent at all levels.

## BASIC MANAGEMENT FUNCTIONS

Management is inherent in command but does not include as extensive authority and responsibility as command. Functions of management are actions that a supervisor takes to get assigned work done. They include planning, organizing, directing, coordinating, and controlling. These are sometimes referred to as principles of management.

### PLANNING

Planning is determining what should be done, how it should be done, where the action should take place, and who should be responsible for it and why. Steps in planning include:

- Defining the purpose.
- Forming the policies, programs, and resource requirements.
- Designing a plan.
- Differentiating between projects.

Schedules, progress reports, reviews, and revisions are the controls which regulate the planning progress.

### ORGANIZING

Organizing is the process of arranging facilities and resources to do the job as planned. Facilities and resources mean

personnel, time, space, and material. They must be systematically arranged in the most practical way to get the job done.

### DIRECTING

Directing, or order giving, is the method by which the director provides the push or motivation to set the organization into action. Thus, directing deals with giving orders which are understandable, consistent with their purpose, and within the capability of the individual or unit receiving them. How and in what tone a director issues orders probably has a greater influence on the ultimate success of the organization than any other single managerial action.

### COORDINATING

This is the method of putting into proper order all the plans, policies, directives, and controls of the units involved in the task. The difference between the words coordinate and cooperate must be understood. To coordinate is to combine elements in suitable relation to each other for harmonious results. It is a process of insuring unity of effort. To cooperate, on the other hand, implies joint action or concurrent effort. To sum up, coordinating is the agreement that takes place before the action. The extent to which the manager coordinates determines the amount of cooperation he gets from people not under his authority.

### CONTROLLING

This is a function of management that is essential to assure that planning, organizing, and directing are going as they should and that men, money, materials, and facilities accomplish the maintenance mission. Methods of control and standards of performance must be established and the results evaluated. Reports and inspections are used to evaluate the results.

## ESSENTIALS OF MAINTENANCE MANAGEMENT

Many different operational situations exist throughout the Army. All maintenance management essentials that would apply to all units cannot be listed here, but the following are among them.

*Number of maintenance man-hours.* One of the essentials of aircraft maintenance management is to find out how many maintenance man-hours will be needed to support the flying hour program. To find this out, the number of maintenance man-hours per flying hour is multiplied by the number of flying hours per aircraft. These figures can be found in AR 570-2. Actual figures vary in different locations and in different circumstances.

*Unit work standards.* Management develops its own work standards. This is done by taking a number of completions of a certain job and the amount of time required for each completion and computing an average time needed. Job standards should be reviewed regularly and revised as needed.

*Job work procedures.* Management should establish standard procedures for doing jobs. Then the men have to consult supervisors only when unusual circumstances arise.

*Maintenance other than aircraft.* In many units, the aircraft maintenance officer is also responsible for maintenance of equipment other than aircraft. Then the maintenance officer must know the types and amount of the other equipment, the amount of maintenance required, and how it will affect the aircraft maintenance program.

*Command coordination.* A matter of collecting and giving information, command coordination can uncover special requirements that would increase or decrease the workload. Coordination is important within the unit, but it should not stop there. It should take place from lower level to higher level and from higher to lower, so that each element is informed about the others.

*Use of resources.* Another essential to successful maintenance management is the proper use of resources. The method of aircraft maintenance--bay shop or bench shop, for example--depends on the qualifications of the assigned maintenance men. Naturally, the method to be used would be the one that would best repair the item in the shortest time, using skills of the available men.

A well organized working area is important to swift and efficient maintenance operations. Commonly used tools should be handy for the mechanic. He cannot maintain an aircraft while hunting for tools. Enough work should be assigned to each man to keep him busy for his full work period. Slack times in the aircraft maintenance workload should be used for training, for maintenance other than on aircraft, and for earned time off.

## MANAGEMENT TOOLS

### RECORDS AND REPORTS

Maintenance and supply records and reports provide the commander and his staff with information relative to status of supplies and equipment, shop workloads, and other information bearing on maintenance and supply operations. Analysis of these reports may show trends and identify problems which can be solved before they develop into serious situations. To be effective, the number and complexity of reports must be minimized.

### INSPECTIONS

Inspections are tools for management that provide an indication of materiel readiness, proficiency of personnel, adequacy of operations, and effectiveness of maintenance and supply management. Inspections permit the inspector to see conditions as they actually exist rather than only as represented in reports. If used properly, inspections provide indications of shortcomings and provide a basis for corrective action.

### VISITS TO SUPPORTED UNITS

Supporting units should conduct frequent visits to supported units. Matters of mission significance may be revealed through such visits. Visits do not carry the stigma that is often associated with inspections. Personnel are more likely to talk freely with a visitor who expresses interest in their problems than with an inspector. They are more apt to discuss specific problems and discuss complaints concerning the support they are getting from supporting units. Subjects to be discussed or observed during such visits include--

- The satisfaction of the unit with the support it is receiving.

- Problems encountered in obtaining required support.
- Future operations of the unit that may be extraordinary demands on equipment and require increased maintenance and repair parts supply support.
- Requirements for technical assistance.
- Adequacy of the unit's maintenance program.
- Proper use of personnel.
- Adequacy of repair parts supply procedures.

## **MAINTENANCE LETTER OR BULLETIN**

The maintenance letter or bulletin can be used effectively as a tool of management and as a method of disseminating timely information on maintenance and repair parts supply matters to supported units. It is informal in nature and published on a periodic basis (usually monthly) to keep maintenance and supply personnel of supported units informed on latest developments. The publication may contain information on stock number changes, changes to direct exchange lists, maintenance tips on new materiel, and similar items that will benefit recipients. This publication can establish and maintain good working relationships with supported units. It provides advice and tips which can be implemented at using unit level with a resultant decrease in the AVIM workload.

## **MAINTENANCE PUBLICATIONS**

Technical information concerning Army maintenance and repair parts supply is found in technical manuals, supply bulletins, maintenance bulletins, and modification work orders (MWO). In the case of aircraft, supplementary publications are issued to give prompt safety of flight information. These publications, essential to safe operation and efficient maintenance of aircraft, are listed in DA Pamphlet 310-4, Index of Technical Publications, and DA Pamphlet 310-7, US Army Equipment Index of Modification Work Orders.

### SUMMARY

Let's sum up a few key points you read in maintenance management.

- The ROC document spells out a part of the maintenance support plan for a new item of equipment.
- The objective of maintenance is to keep Army materiel ready for use in performing its mission and to do it as economically as possible.
- Repairs are accomplished onsite wherever possible and in accordance with maintenance allocation charts (MAC).
- Basic management functions are principles that include planning, organizing, directing, coordinating, and controlling.

With these points in mind, you are ready for an introduction to **aviation maintenance in a combat environment**. This is the title of the next chapter.

## CHAPTER 3

**AVIATION MAINTENANCE  
IN A COMBAT ENVIRONMENT**

Our potential adversaries--the "Threat"--is one of the largest and best trained armed forces in the world. It is well equipped and highly motivated. It is a highly mobile force, heavy in tanks, with self-propelled artillery, infantry fighting vehicles, and air defense weapons system. Threat combat equipment represents the latest models in a continuing effort to increase both quantity and quality. Threat tactics are based on MASS-vehicles, firepower, and manpower. Each weapon is carefully integrated into the "battle system."

Threat forces, however, are not 10 feet tall. They are numerous but they can be beat. The US Army, expecting to fight outnumbered, must be prepared to fight harder and smarter than at any time in its history. The next war may well see virtually every corner of the battlefield subject to attack. The attacks can come from a wide variety of sources and from an arsenal of very functional and effective weapons. No unit, regardless of its mission or location, will be immune from potential attack.

This chapter describes the threat in sufficient detail that aviation intermediate maintenance (AVIM) personnel can train to counter threat tactics and strengths and take advantage of threat weaknesses. Several ideas are given on how to counter the threat. Specifically, this chapter covers:

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## THE GENERAL THREAT

### THE THREAT SOLDIER

The threat soldier is young, tough, and accustomed to hardship. He is well-trained on weapons and small unit tactics. His physical conditioning is excellent. But, the threat soldier has shortcomings. He is not permitted much initiative, latitude, or individuality in his employment on the battlefield. This could well be a major shortcoming for exploitation by our forces. The US Army Transportation Corps soldier can contribute a great deal toward exploitation of threat soldier weaknesses. But, it takes hard work. It will take a high degree of technical competence in all ranks. It will require hard training in the basic skills of marksmanship, physical conditioning, close combat, and active and passive defense measures. Realistic training, exploitation of weaknesses, air superiority, concentration of forces at the most critical point, and superior plans well executed can equalize whatever numerical superiority the threat soldier might possess.

### THREAT TACTICS

Threat forces use the concept of combined arms. Their units are organized accordingly. Motorized rifle (mechanized) troops and tanks operate together. Ground operations are supported by well-planned artillery fires. The enemy commander normally employs his forces in echelons, both in the offense and defense. Only threat offensive tactics are discussed here. In the offense, two echelons are normal. To the defender, the offensive appears to be a series of attacking waves:

- The first echelon is the assault unit. It attempts to rupture and pass through enemy defenses. The attack will normally be preceded by intensive artillery and rocket attacks. The launching of a concurrent, coordinated tactical air attack can be expected. Threat forces can also insert airborne and airmobile forces to isolate our defensive positions, to engage reserves, and to create confusion in our rear areas as their artillery preparation ceases.

- The second echelon is the followup element. It is used to defeat bypassed enemy units. It is used to continue or maintain the momentum of the attack. The second echelon will link up with air inserted units to defeat remaining resistance and to continue the attack to our rear.

### THREAT WEAPONS

Knowledge of threat weapons is important to all soldiers. This includes knowledge of their capabilities and how to recognize them. A few of the threat weapons are shown throughout this chapter to give a small appreciation of what threat forces possess. This is by no means a complete inventory. More detailed information can be obtained by looking at many of the "how-to-fight manuals." See FM 100-5, FM 30-102, and TC 1-88 and SOVIET ARMY OPERATIONS MANUAL.

### THE THREAT TO AVIM OPERATIONS

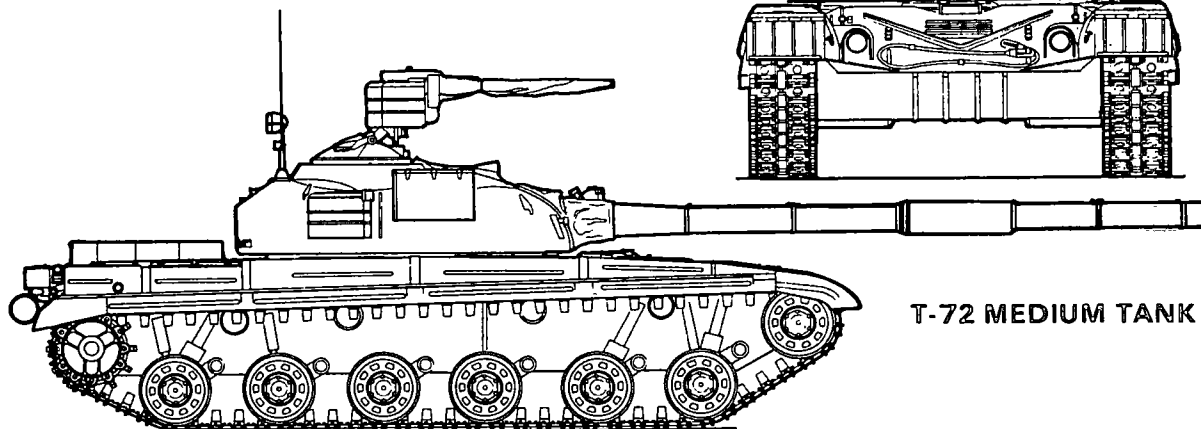
The threat facing Army aviation maintenance operations is just as real as the threat facing our combat forces. Divisional and nondivisional AVIM units in the corps area will be particularly vulnerable to threat forces. Threat forces have a kit full of the tools of war to use against us. They are capable of selecting and using any one of or any combination of these tasks tools of war. For that reason, each of the following perceived threats is discussed.

- Threat maneuver forces
- Threat aviation forces
- Heliborne and airborne operations
- Guerilla and unconventional warfare
- Electronic warfare
- Nuclear, biological, and chemical (NBC) threat

### THREAT MANEUVER FORCES

AVIM operations are likely to have high priority among potential targets. Threat forces will attempt to destroy as many aircraft on the ground as possible. AVIM

units operating in division and corps forward areas must expect the probability of threat offensive operations being conducted against aviation maintenance areas. Threat officers' operations call for penetration well into the corps rear. The ability of AVIM personnel to assist in defense of friendly forces will be based on a number of factors.



T-72 MEDIUM TANK

**TYPE:** Medium Tank

**SPEED:** 64 kmph (40 mph)

**RANGE:** 500 km (310 miles)

**ARMAMENT:** 125-mm main gun 40 round basic load, turret-mounted 12.7-mm antiaircraft machinegun; 7.62-mm coaxial machinegun.

- **RECOGNITION.** The primary requirement for any soldier, regardless of his speciality or career field is the ability to distinguish friend from foe. That's not as simple as it sounds. A war in Europe, for example, would involve many nations equipped with a wide variety of weapons. The problem is expanded when it is recognized that all of these forces will employ captured war material to augment organic elements, replace combat losses, or deceive the enemy. Therefore, recognition training must be based on the use of silhouettes, without regard to national markings. The recognition problem will be made even more difficult by the use of smoke. This includes the use of smoke by both sides and the battle-created smoke, dust, and resulting haze in the area.
- **WEAPONS TRAINING.** Upon successful identification, the next requirement is successful engagement by individual or crew-served weapons. The European battlefield will be characterized by highly mobile forces, dispersed over wide frontages, and occupying only critical terrain. Each unit will be responsible for its own defense and security. Unit training in the use of machineguns, grenade launchers, and antitank and antiaircraft weapons will give the unit a limited capability for defense as well as some offensive potential if needed.
- **TACTICAL TRAINING.** Following recognition and weapons training, personnel will require small unit tactical training to bring the whole effort to fruition. Maintenance, supply, and headquarters personnel should be familiar with basic patrolling and reconnaissance techniques to prevent surprise. Antitank and antiaircraft teams must be formed to serve as reaction forces during breakthrough or air insertion operations.

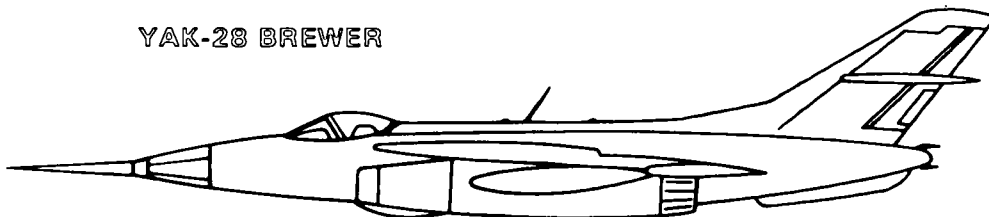
The concept of maintenance forward will expose AVIM personnel to direct and indirect fire, tactical missiles and rockets, helicopters, and high performance aircraft in quantities never before experienced. The distinction between combat, combat support, and combat service support personnel will be virtually nonexistent. No one expects an AVIM unit to stop an armor penetration or a motorized rifle attack. But imagine the amazement, confusion, and frustration if one did.

### THREAT AVIATION FORCES

It can be anticipated that the greatest number of casualties among AVIM personnel will be generated by Threat aviation. Threat aviation can be broken down into four basic categories.

- **RECONNAISSANCE.** Threat forces have employed technically advanced electronic surveillance devices. These devices can detect virtually anything on the surface and some things subsurface. Assuming radar and infrared capability, AVIM personnel will be hard pressed to prevent parked aircraft and ground vehicles from being identified. The threat also possesses a wide gamut of sonic and subsonic reconnaissance aircraft. Most of the reconnaissance systems have ground link capability which means that attack aircraft will be able to respond quickly to potential targets. Concealment, dispersion, and use of dummy aircraft or facilities are just a few of the ways to counter the reconnaissance threat.

YAK-28 BREWER



|                                               |
|-----------------------------------------------|
| <b>TYPE:</b> Reconnaissance                   |
| <b>SPEED:</b> 1,175 kmph (729 mph)            |
| <b>OPERATIONAL RADIUS:</b> 800 km (496 miles) |
| <b>ARMAMENT:</b> One 30-mm machine cannon     |

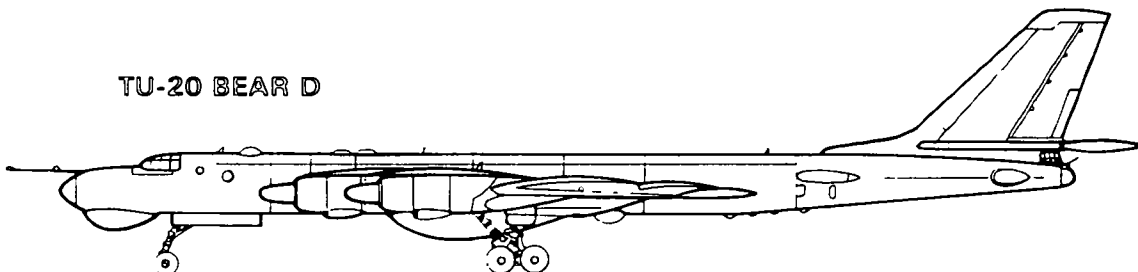


- **STRATEGIC BOMBERS.** The probability of attack by strategic bombers increases the closer you are to:
  - Special ammunition units and facilities.
  - Tactical missiles and rockets.
  - Large troop concentrations.
  - Ammunition storage areas.

- Command and control facilities.
- High performance airfields.
- Ports.
- Critical communication centers.

The best defense against a host of aircraft capable of performing this mission is passive defense characterized by wide dispersal away from lucrative strategic targets.

TU-20 BEAR D

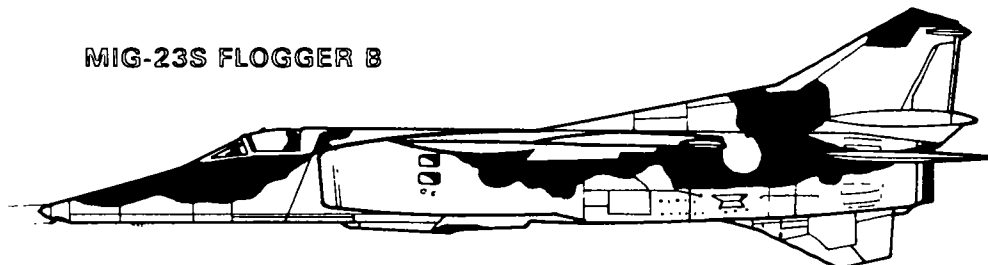


**TYPE:** Strategic Bomber  
**SPEED:** Typical bear, clean, 540 mph (870 kmph)  
**RANGE:** With 25,000-lb (11,340 kg) bomb load 7,800 miles (12,550 km)  
**ARMAMENT:** Six 23-mm radar directed gun systems and 25,000-lb (11,340 kg) bomb capacity

- **TACTICAL AIRCRAFT.** Threat aircraft are controlled by ground control intercept (GCI) methods. Therefore, deep penetration is not as probable as ground support. But, these aircraft may perform deep penetration along lines of communication to interdict resupply and destroy logistical installations such as direct support units/general support

units (DSU/GSU), maintenance and repair facilities, airfields, marshaling yards, bridges, and overpasses. Ground support missions are designed to gain local air superiority. Then they can attack targets beyond artillery range; reinforce artillery, missile, and rocket fire; and attack targets of opportunity in the enemy rear.

MIG-23S FLOGGER B



**TYPE:** All Weather Interceptor  
**SPEED:** 1,350 kmph (840 mph)  
**COMBAT RADIUS:** 640 km (400 miles) miles on Hi-Lo-Hi strike  
**ARMAMENT:** 23-mm twin barrel gun and various mixes of air-to-air missiles

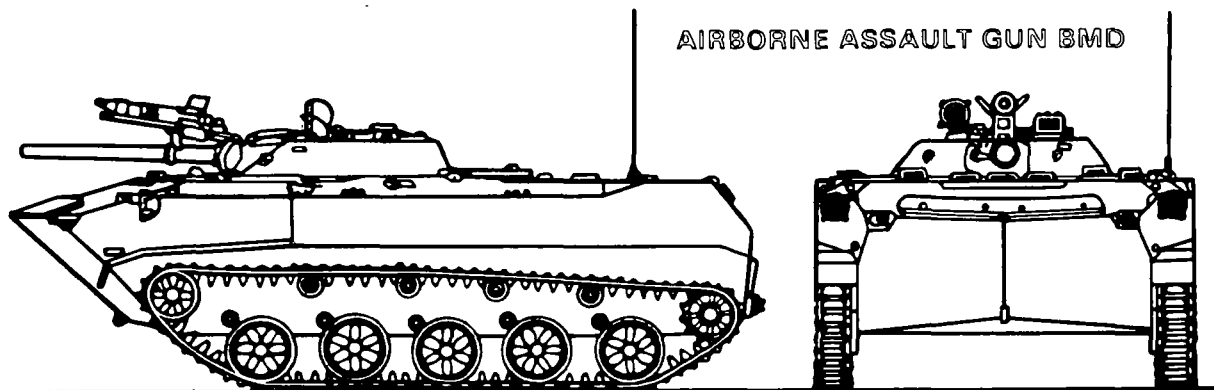
- **HELIBORNE AND AIRBORNE OPERATIONS.** Threat forces have the ability to simultaneously transport up to three of their eight airborne divisions. Airborne forces could be employed to --

- Operate in small teams as reconnaissance and sabotage groups in our rear.
- Operate deep in our rear on high risk missions of strategic importance.
- Operate in their conventional role of being landed by airplane, helicopter,

or parachute to fight a conventional battle until linkup with ground forces.

At least one motorized rifle battalion in each division is trained for air assault operations. These forces would normally be employed to seize--

- Critical bridgeheads.
- Airfields.
- Nuclear storage sites.
- General support logistics facilities.
- Key terrain.



AIRBORNE ASSAULT GUN BMD

**TYPE:** Air-Portable APC  
**SPEED:** 65 kmph (40 mph)  
**OPERATIONAL RANGE:** 400 km (250 miles)  
**ARMAMENT:** 73 mm smooth-bore gun, Sagger missile, and 7.62 mm machine gun.

## GUERRILLA AND UNCONVENTIONAL WARFARE

In the European theater, guerrilla forces may be able to mass in up to company size operations. The role of the guerrilla is basically to reduce the capability of our main forces to occupy the main battle area. They do this by conducting--

- Raids.
- Sabotage.
- Ambushes.

Guerrilla organizations can be expected to conduct operations against AVIM units. Such efforts can cripple our ability to return aircraft to combat service. Actions may include sabotage, parts theft, and general harassment.

Both active and passive defense techniques will be required to overcome potential attacks. And continuous harassment by snipers, sappers, and saboteurs will begin to take a psychological toll in addition to the combat toll. Operations security (OPSEC) measures must be employed to deny outsiders access to motor pools, mess halls, billets, and operational areas. This is especially true of areas where human intelligence (HUMINT) or tactical information could be gained.

## ELECTRONIC WARFARE

Electronic warfare includes signal interception, direction finding, jamming, and imitative deception of communication systems. Threat forces place a high priority

on monitoring or disrupting US Army radios, radars, navigational aids, and fire control systems. Threat forces have the capability to disrupt or intercept any device which emits a signal throughout a wide spectrum.

Most US Army logistical control nets and automatic data processing (ADP) equipment are not secure. Therefore, a high degree of intelligence will fall to the enemy by default. Threat forces also engage in what is called "radioelectronic combat." This is simply the use of radio direction finding, sound sensing, range sensing, and emission detection devices in conjunction with long range artillery. It is used to neutralize or destroy critical command posts, units, or installations. Electronic eavesdropping is employed to intercept, collect, analyze, and identify various signals. Therefore, poor radio telephone procedures, failure to properly use the communications-electronics operation instructions (CEOI), and unnecessary communications will finally result in neutralization of the station. Tactical plans, combat units, and maintenance and supply installations are all subject to destruction by the inadvertent slip on the part of one radio operator. AVIM unit commanders must develop procedures for operating without radios. This is because radios may become inoperative due to the electromagnetic pulse (EMP) of a nuclear detonation.

### NBC THREAT

AVIM personnel in the forward areas may be subject to tactical nuclear weapons. Personnel in rear areas could be exposed to strategic nuclear delivery systems. But on the whole, the chemical threat, particularly in the forward area, is by far the most serious problem. Personnel must be indoctrinated in the use of protective masks and clothing as well as first aid measures. Many AVIM personnel will normally be dispersed and away from chemical monitoring equipment. So, mechanics and repair parts supply and headquarters personnel may be further from immediate medical support and can expect to be more severely affected. Decontamination procedures must be trained and equipment kept ready to be able to resume the mission at the earliest possible moment.



### COUNTERING THE THREAT

To best assess the threat in a given situation, one need merely ask what would be the most effective way of defeating oneself. From that point, technical assistance could be requested from the S-2 or G-2. This S-2 or G-2 can verify your assessment and determine the effectiveness of alternative solutions.

CONSCIOUSNESS OF THE THREAT, and awareness of threat tactics and capabilities are important. They are of singular importance to the adoption of successful countermeasures and ultimate survival. Perceived threats, beyond the ability of the unit to confront, must be brought to the attention of higher headquarters. Commonsense, initiative, and self-control are essential for survival.



### OPERATIONS SECURITY (OPSEC)

Throughout the planning, preparation, and execution phases of an operation, every effort must be made to maintain security. Security measures must also be included in unit training programs. OPSEC is an integral part of planning for AVIM operations, unit training, and day-to-day operations at all levels of command. Unit S-3's work to develop OPSEC protective measures. Four steps in the OPSEC planning sequence are as follows:

- Determine enemy capabilities for obtaining information about AVIM operations.
- Determine what information obtained by the enemy can compromise the operation.
- Determine what actions taken by AVIM units before an operation, if known and analyzed by the enemy, would provide him with the information he needs.
- Determine what protective measures are necessary and where they must be implemented to maximize OPSEC. Some OPSEC measures are as follows:
  - **COUNTERSURVEILLANCE** includes all active or passive measures

taken to prevent threat forces from seeing your area, equipment, movements, etc. Here are some techniques:

- Camouflage equipment.
  - Practice night maintenance operations.
  - Break up maintenance operations into small elements dispersed over wider areas using terrain as concealment.
  - Maintain noise and light discipline.
- **SIGNAL SECURITY (SIGSEC)** is the use of communications and electronic security techniques to prevent disclosure of operational information. Some practical techniques are as follows:
    - Use messengers.
    - Use communications codes and secure voice equipment if radio transmission is required.
    - Keep radio transmissions short.
    - Maintain signal silence whenever possible.
    - Use wire communication when possible.
    - Use low power in radio.
  - **PHYSICAL SECURITY** is the use of security forces, barriers, dispersal, concealment, and camouflage to deny enemy access to facilities, areas, equipment, and personnel in order to protect operational information or activities. A few techniques to use are to--
    - Train and employ security elements around maintenance and supply facilities.
    - Use listening and observation posts.
    - Identify avenues of approach into work areas and cover them with fields of fire.

- Employ obstacles that will impede the enemy.
- Maintain noise and light discipline.
- Use challenge and passwords.
- Use early warning devices.
- **INFORMATION SECURITY** is the control of written, verbal, and graphic information to prevent the disclosure of operational information. To provide this, you can--
  - Pass sensitive information only on a need-to-know basis.
  - Examine refuse for possible intelligence breaches.
  - Never post information out in the open.
  - Not allow local civilians into work and assembly areas.
  - Properly handle all classified and sensitive documents.

adjacent units and area support groups. The plan should be simple. Generally, the main concern is for defense against aircraft, airborne or heliborne, guerrilla, and nuclear or chemical attacks. Ground attacks should never be discounted.

## SECURITY AND DEFENSE PLANS

In security and defense planning, the concern is with combining your perception of the threat with OPSEC measures while developing a plan for the security of AVIM operational areas. It is important for the AVIM commander to know what defensive measures are to be taken during ground, air, airborne or heliborne, guerilla, and nuclear, biological, chemical (NBC) attacks. The commander makes sure that personnel are assigned specific duties with respect to security defense measures. He also makes sure they are familiar with their duties. The commander has his staff survey his operations and make plans to lessen the possibility and effects of an attack. They use all means available to include OPSEC planning steps and the inclusion of OPSEC measures into operational plans and standing operating procedures.

Security and defense plans must be flexible. Maintenance operations reduce the number of personnel available for security and defense; therefore, the plan should include support available from other sources such as

## SUMMARY

What you have read about the THREAT is real and it is important. Here are some key thoughts that should stay with you:

- The threat soldiers, the tactics their commanders use, and the weapons they will have are among the finest in the world.
- Divisional and nondivisional AVIM units in the corps area will be particularly vulnerable to threat forces.
- Concealment, dispersion, and the use of dummy aircraft are a few of the means you can use to counter reconnaissance threat.
- Active and passive defense techniques must be used by AVIM personnel to overcome potential guerrilla attacks.
- Poor radio telephone procedures, failure to properly use the CEOI, and unnecessary communications result in neutralization of the station.
- In the forward area, the chemical threat is the most serious problem of the NBC threat.
- Countering the THREAT means you must be conscious and aware of Threat tactics and capabilities.
- Security to AVIM units is very important; security in the areas of operations, signal, and physical security are part of any security plan.

Now that you have been exposed to aviation maintenance in a combat environment, let's find out what goes on in the general area of aviation maintenance operations. The next chapter discusses that subject.

## CHAPTER 4

# AVIATION MAINTENANCE OPERATIONS

Suppose the workload in an aviation unit maintenance (AVUM) shop becomes greater than the unit can handle, or special tools and lights used for night aircraft maintenance break or become inoperative. How does an aviation intermediate maintenance (AVIM) company help out in such a situation? It provides technical assistance on the proper procedures for performing preventive and unit maintenance (this takes care of the great workload) and it provides repair parts and lights for the night aircraft maintenance problem. In other words, the supported unit (AVUM) looks to the supporting unit (AVIM) for help and guidance.

This chapter tells you about the operations of a supported AVIM unit, the functions of the various elements of that unit, and how they assist a supporting AVUM unit. Following are the topics covered in this chapter:

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## COORDINATING MAINTENANCE OPERATIONS

Close coordination between supported units and supporting maintenance units will eliminate many difficulties between them and result in a smooth, well organized maintenance operation. Supported units can speed up the maintenance operation by correctly preparing maintenance requests and completing all unit maintenance before moving equipment to the supporting maintenance activity. Another way to expedite maintenance and gain AVIM level training for unit personnel is to allow the assigned crew chief to accompany his aircraft to the AVIM unit. The supported unit commander and the commander of the supporting maintenance company should plan jointly in determining requirements for maintenance and repair parts supply. They should establish, insofar as possible, a mutually acceptable schedule of equipment into the supporting activity. If either commander foresees a possible deviation from the established plan, he should immediately advise the other. They then should coordinate in making necessary adjustments. Such action--

- Enables the supported unit commander to better plan and manage his unit maintenance.
- Enables the supporting unit commander to program and manage the support workload, to anticipate repair parts requirements, and to make timely requests for assistance when needed.
- Contributes to more rapid repair and return of equipment to the user.
- Enables the supported unit commander to more accurately predict the availability of operational equipment that can be sustained over a given period.

## SHOP OPERATIONS

When you hear the term "maintenance shop" in an AVIM company, you will know that this is an all-inclusive term. All facilities of the company that are directly used in controlling and maintaining aircraft are in the maintenance shop. Platoons and sections

in the shop are needed to do such things as maintain ground support equipment; maintain operational readiness float aircraft; repair unserviceable equipment; administer, plan, and control the maintenance workload; and evaluate the quality of work performed.

### *Ground Support Equipment*

To properly maintain and operate aircraft, you need support equipment which, in some ways, approaches the complexity of the aircraft itself. Auxiliary power units, compressors, heaters, towing vehicles, fueling vehicles, test stands, and electronic test equipment are examples of ground support equipment that must be maintained and ready to function when needed. Preventive maintenance and scheduled maintenance services must receive constant attention; technical publications and repair parts must be on hand to insure responsive ground support equipment availability.

### *Operational Readiness Float Aircraft*

Operational readiness float aircraft are maintained to provide replacement for unserviceable aircraft that cannot be repaired in time to meet a user's requirements. If float aircraft are authorized, they will be maintained by the transportation aircraft maintenance company and issued and controlled in accordance with policies and procedures established by higher headquarters.

- Operational readiness float aircraft will be exchanged on an item-for-item basis within basic mission, design, and series. Requisitions and turn-ins are not required. Float aircraft will be issued by command action. All equipment not included in aircraft basic issue items list (BIIL) are maintained by separate accountability; i.e., table(s) of organization and equipment (TOE) weapons system will be removed prior to exchange.
- When an aircraft is evacuated to an AVIM unit and it is estimated that actual repair or modification time will exceed 45 calendar days, or that limit established by the major commander, the AVIM unit commander will consider the aircraft as a candidate for evacua-



tion to a depot unit. In any event, whether the aircraft remains in the unit or is evacuated to a depot unit, a maintenance float aircraft will be issued by the AVIM units.

- Repair time criteria used in determining when to provide an operational readiness float aircraft to a unit will be established by the appropriate major Army commander.
- All specially equipped and special mission aircraft and aircraft involved in operational plans for which identical mission, design, and series exchanges are not available will not be exchanged for operational readiness float aircraft but will be repaired on a return-to-user basis.

**Production Methods.** Production methods used in an AVIM shop include bay shop or dock (job shop) and bench shop repair. The type of production method used is determined by the type material to be repaired and personnel, facilities, and time available.

**Bay Shop or Dock Method.** The bay shop production method is used when a variety of jobs are performed in the shop or when the item being repaired is difficult to move. Under a bay shop method of operation, the aircraft to be repaired remains in one shop location until the work has been completed. The men and facilities necessary to do the work move to the equipment. Under a modified bay shop or dock operation, personnel and equipment to be repaired move from one section to another at irregular intervals until the work has been completed. Assemblies and components and items of on-equipment material may be moved from an end item in a bay and sent to other shops (for example, electrical shop) for repair.

In most cases, bays or docks are nothing more than physically separated sections of the maintenance area, where work is performed in the open or under maintenance shelters. If adequate covered space is available, buildings may be divided into bays (or stalls).

**Bench Shops.** Bench shops are used for the repair of--

- Small items.
- Items requiring a high degree of technical skill.
- Items wherein repair requires the use of equipment mounted in a shop vehicle.

Work performed at stands or benches under maintenance shelters or within shop vehicles is considered bench shop repair. Items repaired by this method include aircraft components and assemblies, instruments, fuel and electrical system components, electric motors, and communications-electronics items that must be repaired under controlled conditions.

The extent of maintenance performed on specific items is often restricted by time limitations. This is normally stated in number of days allowed to repair a certain item. When determining if time limitations will be exceeded consider the--

- Availability of repair parts.
- Shop workloads.

Time limitations are subject to fluctuations. Various headquarters may establish time repair limitations for their units. These limitations will be based on local conditions and TB 43-0002-3.

Before repairing an unserviceable item, maintenance man-hour reparability must be determined. Consider the service life of the aircraft (how many hours left before rebuild) if it is repaired. When repair man-hours exceed maximum maintenance man-hour limitations, cannibalization or disposal of the unserviceable item is undertaken, unless necessity dictates otherwise. In some cases, the criticality of the item and the difficulty to replace it require repair regardless of man-hours.

Criteria have been established governing inspection and classification of material to determine man-hour reparability. Classification inspections are not performed when the material is obviously reparable. The classification inspection is not to be confused with the initial technical inspection.

Classification inspection is performed when preliminary diagnosis or initial inspection indicates that the number of man-hours of repairs is likely to exceed repair limits. Maintenance man-hour limitations are contained in TB 43-0002-3, other technical bulletins (TB's) developed by the Federal Supply Classification (FSC) group for end items and selected repair parts and assemblies, and pertinent supply bulletins (SB's) dealing with repair and serviceability criteria. Maintenance standards are also contained in technical publications pertinent to the item(s) of equipment involved. For additional details on man-hour determination and application of repair limits, see AR 750-1.

During the stress of combat, the application of regulations must be relaxed to facilitate operations. Repair limitations may not be applied in a combat theater. Instead, repair limitations will be based on availability of the item in the theater, time and repair parts necessary for repair, ease of resupply, and shop workloads.

Weight and balance becomes increasingly important as aircraft load capacity is increased. Many aircraft accident investigations have revealed inaccurate use of weight and balance data by operating personnel. Support maintenance units are responsible for weighing Army aircraft. The unit commanding officer, maintenance officer, and the individual Army aviator are responsible for maintenance and computation of weight and balance data in accordance with AR 95-16.

AVIM activities will have the following duties and responsibilities:

- Weigh each class I aircraft under their jurisdiction when overhaul or major airframe repairs are accomplished, when any major modifications have been made to the basic airframe, or when weight and balance data are suspected to be in error.
- Weigh each class II aircraft when overhaul or major airframe repairs are accomplished, when any major modifications have been made to the basic airframe, or when weight and

balance data are suspected to be in error. Class II aircraft shall, in any case, be weighed when the period since the last weighing exceeds 30 months.

- Have the aircraft weighing equipment under their jurisdiction calibrated in accordance with TB 43-180 and other pertinent technical manuals.

## PRODUCTION CONTROL

Organization of the production control element varies from one maintenance activity to another. No one system can satisfy the requirements of all activities. Some of the areas of consideration are space and facilities available. Others are the geographical location and the number and type of equipment being maintained. A typical production control element includes the following functions or general areas of responsibility:

- Coordination of all work input into the maintenance activity.
- Coordination of output of the finished product.
- Coordination of the flow of intrashop maintenance requests.
- Coordination of all parts requests.
- Coordination of procurement of equipment and tools required in performing the maintenance mission of the support activity.
- Transportation for contact teams and technical assistance teams.
- Coordination of all test flights.
- Transportation for the recovery teams.
- Overall supervision of the training and cross-training of maintenance personnel.
- Maintaining the maintenance request register and the in-process file (tub file).
- Maintaining the production control board, keeping it current in accordance with the unit's procedures.

The following tools must be obtained or improvised to insure a successful production control operation.

quarters. The production control board should be accessible to key personnel of the maintenance activity such as platoon leaders and section chiefs. They should be able to obtain information on the progress of work in other shops or sections in relation to work in theirs. A typical design of the production control board is shown here.

[illegible]

Moderation and simplicity should be observed in the design of the board. Accuracy and promptness of entries on the board must be maintained at all times. **AS A MINIMUM, THE BOARD MUST SHOW THE FOLLOWING INFORMATION:**

- The actual workload in process.
- Work awaiting shop entry.
- Location of work within the shop.
- Reasons for work stoppage.
- Work awaiting receipt of parts.
- Completed work awaiting disposition or pickup.

***The In-Process File (also called tub file)***, is a container used by production control for active maintenance requests and records file jackets. The status of a repair job in the shop is indicated by the location of its maintenance request and records file jacket within the tub file. The tub file is manufactured locally and should be lightweight and portable. The following illustrated tub file (page 4-7) is best suited for use by the maintenance activity where frequent moving is not required. However, it may be adapted for use in the field by eliminating sections within compartments and reducing its size. The tub file is organized as follows:

- **Compartment 1, Inspection and Determination of Parts.** When initiated, the maintenance request and records file jacket are placed in this compartment. They remain here until the following actions have been taken:
  - Initial inspection.
  - Routing of the intrashop maintenance and worksheets of DA Form 2404 (Equipment and Maintenance Worksheet) to the responsible sections or platoons.
  - Determining the repair parts needed to complete the job.

Disassembly during maintenance may reveal a need for additional parts.

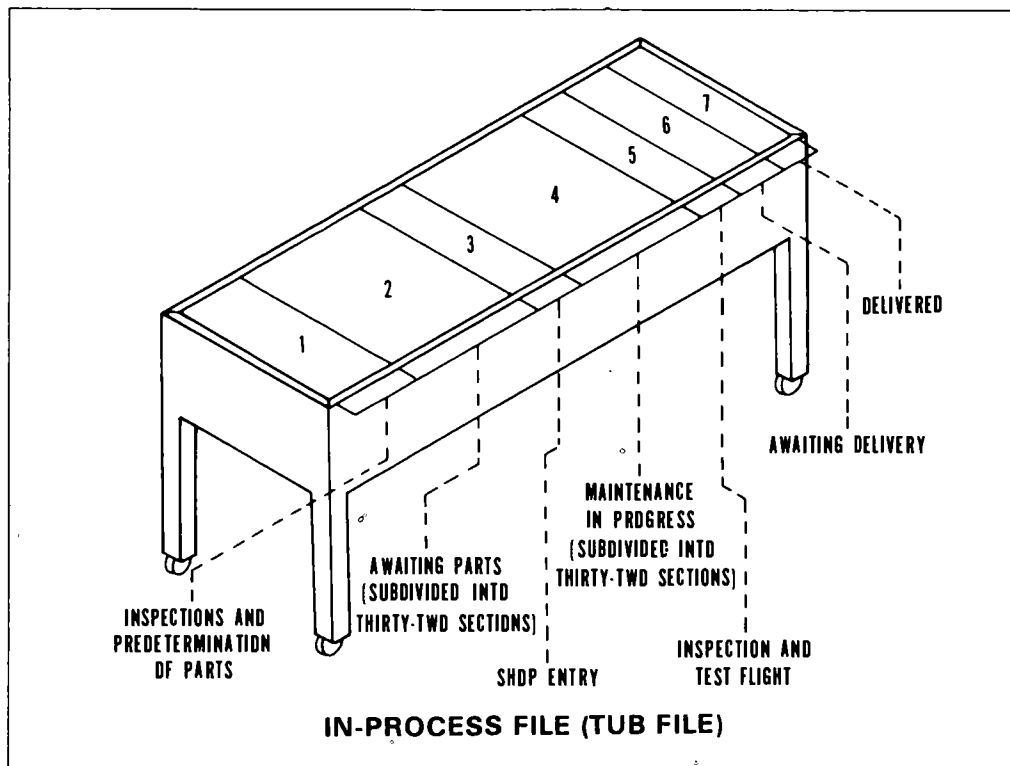
- **Compartment 2, Awaiting Parts.** If work must be delayed, the maintenance request and records file jacket are placed in one of the 32 sections in the second compartment. If the delay is caused by some administrative matter which must be resolved before work proceeds, the file jacket is placed in the first section, which is unnumbered. The remaining 31 sections are numbered 1 to 31; each section represents a day of the month. If the workflow delay is caused by a lack of parts, the file jacket is placed in the section which corresponds to the requisition date of the part(s). This procedure provides a flagging action and a reminder for followup supply action. It also serves as a means for determining

requisitioning time on critical and routine items. This method reveals time required for repair parts to be processed and put in the hands of maintenance personnel. Maintenance should not be delayed solely because all parts are not on hand. If sufficient parts are not available, work is started without delay, and the file jacket is placed in the third compartment. However, the flagging action is continued for outstanding requisitions. This is done by placing a strip of manila folder bearing the maintenance request control number in the section which corresponds to the original requisitioning date of parts.

- **Compartment 3, Shop Entry.** When the job is ready to enter maintenance, the file jacket is placed in this undivided compartment.
- **Compartment 4, Maintenance In-Process.** This compartment is divided and numbered as in compartment number 2. When repairs are actually started, the file jacket is placed in the section which represents the estimated date of completion. This alerts production control when it appears that the job will not be completed as scheduled. As the scheduled date of completion approaches, production control analyzes information on the production control board. Information on daily shop status reports is analyzed, too. If it appears that the schedule will not be met, the reason is determined, and a revised completion date is agreed upon.
- **Compartment 5, Inspection and Test Flight.** When repair is completed, the file jacket is placed in this compartment. It remains here until the final technical inspection and/or test flight or until maintenance operational check on the equipment has been accomplished.
- **Compartment 6, Awaiting Delivery.** Following successful completion of the final inspection and/or test flight or maintenance operational check of the aircraft, the file jacket is placed in the sixth compartment. It remains there until final joint inventory has been

accomplished and the supported unit accepts delivery of the aircraft.

- **Compartment 7, Delivered.** After the aircraft has been accepted by the supported unit, the maintenance request and records file jacket are placed in this compartment. The records are retained or disposed of as described in TM 38-750.



**The Maintenance Request Register (DA Form 2405)** is a chronological record used to identify work requests received and job orders accomplished by the supporting activity. The register is also a record of supplemental information which should include the type of equipment repaired, serial number or other identification, owning unit, and the date (Julian) of receipt of the maintenance request. Adequate control may require maintaining separate maintenance request registers for fixed-wing aircraft, rotary-wing aircraft, and components. Allied equipment may be carried on the register maintained for the type of aircraft with which the equipment is associated. The purpose, use, and preparation of the form are discussed in TM 38-750.

**An Operation Map** should be provided and may be maintained for many uses. In the production control element of a supporting activity, it is a ready reference to the location of supported units. This is especially important when sending out a contact team, an inspection team, or a recovery crew. A simple way to construct an operations map is to attach the map to a portable stiff-back surface. The surface should fold or come apart. It should be covered with a sheet of acetate. The map should be large scale, about 1:50,000. Use military symbols (FM 21-30) in pinpointing supported units or other points of interest. Security regulations must be observed in the use of maps.

**An Advance Maintenance Request File** consists of all advance maintenance requests

(DA Form 2407) prepared in accordance with TM 38-750 and filed together. This advance maintenance request file can be used to assist the production control officer in programing workloads and to speed up availability of required parts. Requests should be submitted immediately upon disclosure of maintenance requirements. The requirement must be of a nature suitable for deferment until the next scheduled entry of the aircraft into support maintenance (for example, a minor shortcoming). Maintenance requests for time change of components or modification work orders (MWO) should also be included in this category. In addition to the request file, DA Form 2405, Maintenance Request Register, is normally used to record advance maintenance requests.

*Time Change Components* are those components that are changed at a particular hour level regardless of the condition or serviceability. A workable monitoring system for these components has been established to insure that replacements are on hand when the time change components come due. Keeping track of what parts are due for change and when they are due for change must be accomplished by responsible personnel. A time change component chart or bar graph can be used to monitor the program. For details see TM 55-411.

*Flexibility* in a production control element means being able to adapt to changing patterns of maintenance. A good production control element is concerned with both the present and the future. The control itself is not in accomplishing the work but regulating the production of others. Production planning and control operations will vary from one maintenance supporting activity to another. One system cannot satisfy requirements of maintenance shops operating under different conditions, supporting various types of aircraft. However, the general procedures presented in this manual may be modified to suit individual requirements. Flexibility should be maintained at all times in the production control of an Army aircraft maintenance activity. The cross-training of maintenance personnel will provide flexibility in productive man-hours. In civilian aircraft operations, there is a different maintenance workload pattern

between summer and winter, with a maximum demand for aircraft in summer. Therefore, aircraft can be spared more easily for "length-time span" work in the winter. Army aviation units do not enjoy this seasonal fluctuation in maintenance demands. Army aircraft must be maintained in a high degree of combat readiness at all times. Of course, "length-time span" work may be scheduled for slack operational periods. The term "flexibility" therefore indicates the ease with which a shift in emphasis can be effected with the least delay. Optimum cross-training, where everybody can do every job which is likely to arise, is almost impossible to achieve. This is especially hard to achieve and at the same time maintain standards. However, a large degree of specialized skill is essential within every aviation military occupational specialty (MOS) group. Because of this, the mechanic or repairer requires little assistance from his supervisor. The supervisor can devote more time to the overall supervision of the section. This leads to more effective and realistic supervision. Cross-training thus becomes a compromise between the individual's flexibility versus his specialized skill. The degree of compromise largely depends on the individual's versatility. If the maintenance commitment is stabilized, it is desirable to program movement of individuals between sections. By so doing, personnel can be temporarily transferred to other sections to meet demands. In a rapidly changing commitment, enforced flexibility is sometimes necessary.

*Operational Adjustments* are ideally made when coordination among all personnel has been effected and all parts needed for a given maintenance job are on hand prior to actual arrival of the aircraft. But communication (discussions in person or over the telephone) must be established between the production control element of the AVIM and the supported units. Friendly and well-disciplined relations are essential when doing business. Scheduled maintenance is not hard to coordinate; demand maintenance, or unscheduled maintenance, creates problems. Demand maintenance requires operational adjustments; all persons concerned with maintenance must appreciate and

know that certain actions may be necessary that would not be a problem if demand maintenance could be forecasted.

**A Scheduling System** is used whereby aircraft is returned to the user with the least possible delay and promoting an efficient workflow. It is difficult to put down an ironclad plan for scheduling maintenance into a support activity. Many contributing factors must be considered such as amount of flying hours, numbers and types of aircraft, availability of tools, and supply of major components, parts and hardware. Coordination, planning, and scheduling are closely associated with each other. Planning and scheduling should be done by experienced production control officers and noncommissioned officers. They should detail the work necessary to achieve results in the most expeditious and efficient way. Scheduling is mainly concerned with what is to be done and when. When preparing intrashop maintenance requests and equipment inspection and maintenance worksheet (DA Form 2407), production control should use assistance from quality control. The maintenance requests and worksheets should specify in detail all work required or inspections to be performed; for example--

- Removal of medical component.
- Inspection of replacement component to insure serviceability.
- Installation of new component.
- Parts used.
- Time expended.
- Reason for failure.
- Final inspection of new component and its attachments when reinstalled.
- Signature of individual doing the work.

The following procedure is for a typical production control element in an AVIM unit. The procedure includes the entry of aircraft or their allied equipment into the maintenance unit. It also includes control of work and records as they progress through the different shops and sections and delivery of the finished product.

**A Pre-Entry Test Flight** performed on aircraft scheduled for maintenance may be conducted whenever practical. The flight should be performed by maintenance test pilots. The results should be reviewed by the maintenance officer and production control officer to determine the platoon or section to complete the required maintenance. Discrepancies and shortcomings noted on the flight should be listed on DA Form 2404, thus becoming a part of the initial inspection. The technical inspector assigned to perform the initial inspection on the aircraft should accompany this flight.

#### **Step-by-Step Procedures.**

- When the aircraft arrives at the maintenance company for entry, production control receives the DA Form 2407 and the aircraft's equipment log assembly (records).
- Production control reviews, then accepts the maintenance request. When the maintenance request is accepted, the aircraft is logged in on a DA Form 2405 and a records jacket is initiated. The records jacket containing DA Form 2407 and the log assembly are sent to quality control.
- Production control completes block 24 of DA Form 2407 and gives a receipt copy and the carbon of the inventory sheet to the supported unit representative. Production control begins directing workflow through the various shops. All entries for maintenance requirements are entered on the production control board. The records jacket is placed in the tub file.
- As work progresses through the shops and sections, in-process inspections should be conducted. As the intrashop maintenance requests are completed, they are inspected by the quality control section and routed to production control. The working copy of DA Form 2404 should be the last item of paperwork turned in. Production control extracts the necessary information from the completed intrashop maintenance requests and DA Form 2404 and enters it on DA Form 2407.
- Production control receives and consolidates all the accumulated documents

relative to the maintenance performed on the aircraft. This indicates that the required maintenance is complete. Production control will then request quality control to perform a final inspection on the aircraft and furnish the necessary paperwork, forms, and records for this purpose. This inspection, along with the recorded in-process inspections, assures that a high degree of maintenance has been performed. The final inspection determines that the aircraft has been made airworthy. It also insures the proper reinstallation of inspection plates and inspection panels, and that the aircraft has been properly serviced and cleaned. Forms and records in the aircraft's equipment log assembly (records) should be checked to insure that they are up to date and neat, and that all entries are correct.

- When final inspection is completed, the technical inspector enters his signature or initials and the Julian date in block 26 of DA Form 2407. This indicates that he has inspected the aircraft and determined that all services and repairs have been accomplished. The maintenance or repairs requested may be carried in block 17 of DA Form 2408-13 (Aircraft Inspection and Maintenance Record) as a red X item. If this is the case, the technical inspector must place his signature in block 18 in accordance with TM 38-750.
- This signifies that the technical inspector has inspected the items and that they have been corrected. Original copies of DA Form 2404 should be affixed to DA Form 2408-13. Determination is made by the technical inspector as to whether or not a test flight or maintenance operational check is required in accordance with TM 55-1500-328-25. He then prepares a test flight inspection checksheet and notifies production control that a test pilot is required. The basic issue items list (BIIL) gear and loose equipment required for test flight purposes are removed from the loose equipment storage area and reinstalled in the aircraft.
- Test flight is completed, and a post-test-flight inspection is performed on the

aircraft. If aircraft is not released for flight the required entry is entered on DA Form 2408-13 in accordance with TM 38-750 and TM 55-1500-328-25. The aircraft is prepared for test flight again. It is recognized that certain items of equipment may not have been placed in the aircraft prior to the test flight. They should be replaced before the aircraft is released to the supported unit. Quality control returns the completed paperwork, forms, and records to production control. Production control notifies the using unit that the aircraft is ready for delivery. The AVIM crew chief and the supported unit's representative perform a joint inventory of the BIIL gear and loose equipment. The maintenance request clerk enters in column h of DA Form 2405 the Julian date the aircraft maintenance was completed. The supported unit's representative completes block 27 of DA Form 2407 and his carbon copy of the aircraft inventory sheet, signifying that he accepts delivery of the aircraft.

### QUALITY CONTROL

Quality control activities complement those of production control to complete the overall control aspect of maintenance management. Quality control management is coordinated with all phases of production and workload control to insure that maximum production effectiveness is maintained. Properly designed quality control procedures can assure an acceptable level of quality and a decrease in inspection requirements and management effort. However, in no event are quality standards sacrificed solely to increase production. To assure complete objectivity, quality control personnel are made directly responsible to the maintenance unit commander.

### FUNCTIONS

The primary technical functions of quality control characterize a true quality control program as distinguished from a pure inspection program. Primary technical functions include insuring that test, measuring, and diagnostic equipment (TMDE) are calibrated in accordance with TB 43-180, eliminating



deficiencies, and improving existing maintenance methods.

Quality control personnel establish and maintain a complete and up-to-date set of all technical publications applying to the maintenance performed in a shop. These publications include technical manuals, technical bulletins, lubrication orders, and modification work orders. They provide instructions on the operation, maintenance, repair, modification, serviceability standards, testing, storage, issue, and inspection of equipment and procedures. This technical data master file should be made available to maintenance personnel in the shops concerned. A technical data familiarization chart should be used and maintained by quality control personnel. The chart can be used to insure that maintenance personnel are familiar with the contents of each technical manual pertaining to their responsibilities. The chart should list all technical manuals pertinent to that equipment for which the shop has maintenance responsibilities. The manuals can be listed in columns at the left of the chart with the names of maintenance personnel listed diagonally across the top. Maintenance personnel initial the appropriate block of the chart to indicate an understanding of the technical manuals. As changes are received, the latest change number is posted and the initials are erased. The mechanics reinitial the board as the changes are made. When an organization contains 10 or less maintenance personnel, a familiarization chart may not be required. In this case, maintenance personnel should indicate their understanding by initialing each manual.

## TASKS

Quality control personnel carry out the following tasks:

- Review and update all shop standard inspection procedures files to incorporate new inspection techniques and to establish procedures for new equipment.
- Collect deficiency data by performing various types of inspections and evaluating complaints received from supported units. Each complaint is investigated to determine the cause of

the deficiency and the corrective action to be taken. Detailed results of the investigation and recommendations are submitted to the unit commander. Quality control personnel will advise the unit commander if action should be taken which is not within the scope or responsibility of the maintenance unit. A report of all findings, corrective action, and recommendations is submitted to the source of the complaint. When repetitive deficiencies are discovered, quality control personnel will perform an investigation to determine the cause and the corrective action to be taken. The investigation will identify the source, cause, organization, and personnel responsible for the deficiencies.

- Monitor the application of modification work orders (MWO). The instructions in MWO are specific as to the work required and how the work is to be accomplished. Quality control personnel assure that these instructions are followed.
- Maintain certification records for personnel conducting tasks that need formal certification; for example, non-destructive inspections.
- Monitor technical publications for errors. When an error is discovered, a DA Form 2028 (Recommended Changes to Publications) is forwarded to the appropriate publication control office.
- Responsible for inspecting the accuracy of equipment records required to be maintained by TM 38-750. This responsibility encompasses the proper use, preparation, and disposition of those records. This is normally accomplished by the shop officer and equipment maintenance clerk.
- Monitor servicing procedures and safety precautions to be observed while servicing equipment with petroleum products.
- Since an additional aspect of quality control is within the supply platoon, supply platoon personnel inspect material received to the extent necessary to prevent unsatisfactory material from

entering the stock inventory. They also insure that care of supplies in storage is such that only completely serviceable items are issued, that damaged or deteriorated items are removed from stock, and that proper packaging and preservation procedures are complied with. When inspecting, check to insure that--

- Stock is issued on a first-in, first-out (FIFO) basis.
- All applicable modification work orders have been applied.
- All data or history record cards accompany the item issued and the proper condition tag is affixed to the item.
- All shipments are properly loaded, blocked, braced, and secured to prevent any damage to the material or the transporting shipment.
- Proper packaging and preservation procedures have been used.

## NIGHT MAINTENANCE

### REQUIREMENTS FOR NIGHT MAINTENANCE

In recent conflicts, the US forces have had air superiority. The requirement for light discipline and night maintenance has been limited. In future conflicts, total air superiority may not exist. Therefore, night maintenance will be required to--

- Correct maintenance backlogs.
- Prepare aircraft for the next day's flight.
- Prepare for frequent moves or displacements.

For information about night maintenance training, see chapter 12.

### PREPARING FOR NIGHT MAINTENANCE

Following are some cautions and factors to be considered when preparing for night maintenance.

- Your unit is normally staffed for a 12-hour day and augmentation must be requested.
- Your eyes normally require about 40 minutes to fully adapt to darkness.
- A loss of depth perception and color distinction will occur during the hours of darkness.
- Smoking three cigarettes in rapid succession or 20 to 30 cigarettes a day reduces night vision by 20 percent.
- There is an increased danger of foreign object damage (FOD) at night.
- Being tired affects a mechanic's night vision and muscular actions.
- What you eat affects night vision; foods high in vitamins should be provided.

### MAINTENANCE RECORDS, PUBLICATIONS, AND REGULATIONS

TM 38-750 prescribes procedures for the use, preparation, and disposition of forms and records of the Army maintenance management system. Proper use, preparation, and submission of the forms in TM 38-750 by operational units is the key to the entire integrated system. These forms are used by the commander to check his operational status, trouble spots, and equipment use and performance.

The Army Aircraft Logbook, DA Form 2408 series, is a permanent historical record made of DA forms which are flight reports and maintenance records of each aircraft and its components. AR 750-31 provides guidance on the location of aircraft historical records. A logbook gives a commander a record of the combat-ready status of the aircraft. Forms are kept in two separate 8- x 10-inch looseleaf binders made specifically for an equipment logbook. One is for historical records and is kept in the quality control office; the other is for maintenance and operation related forms and is kept in the aircraft. Logbook forms and their use are displayed in the following chart:

## LOGBOOK FORMS

| Form number     | Title                                           | Use                                                                                                                                                                                                                        | Disposition                                                                                                                                                                                                                                                            |
|-----------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DA Form 2408    | Equipment Log Assembly (Records)                | Gives a reference to symbols used in logbook.                                                                                                                                                                              | Remains in front of logbook.                                                                                                                                                                                                                                           |
| DA Form 2408-4  | Weapon Record Data                              | To provide a continuous record of firings and component replacements on armament system and subsystem(s). Maintained in the aircraft logbook on which the armament is mounted.                                             | Form attached to weapon when evacuated or stored. Form destroyed and new one initiated upon overhaul or rebuild of weapon. Form filed, data transferred to new form. Filled form retained 90 days or until new form is filled, whichever occurs first, then destroyed. |
| DA Form 2408-5  | Equipment Modification Record                   | To record data about modification on assemblies or components.                                                                                                                                                             | In logbook for equipment on which assembly is installed. Accompanies assembly when it is removed and placed on another end item.                                                                                                                                       |
| DA Form 2408-9  | Equipment Control Record                        | To provide initial basic equipment acceptance and identification information. Also provides means for updating information on ownership, location, usage, transfers, gains, losses, overhaul and rebuild, and disposition. | Disposition varies in accordance with form use. Instructions contained in TM 38-750 and TM 38-750-1.                                                                                                                                                                   |
| DA Form 2408-12 | Army Aviator's Flight Record                    | To record aircraft time and mission, and to record duty and type of flight performed by the aviator and crew.                                                                                                              | Sent to the operations office at the end of each day. Destroyed after 3 months.                                                                                                                                                                                        |
| DA Form 2408-13 | Aircraft Inspection and Maintenance Record      | To record aircraft faults and action taken to correct them; to show flying hours, maintenance performed, and when inspections become due.                                                                                  | Sent at the end of each day to the aircraft maintenance office of the activity maintaining the aircraft. Destroyed after 6 months.                                                                                                                                     |
| DA Form 2408-14 | Uncorrected Fault Record                        | To list uncorrected faults on aircraft, including overdue replacement of components.                                                                                                                                       | Destroyed 6 months after date of last entry.                                                                                                                                                                                                                           |
| DA Form 2408-15 | Historical Record for Aircraft                  | To record historical data about an aircraft.                                                                                                                                                                               | Permanent record in logbook, accompanies aircraft on transfer.                                                                                                                                                                                                         |
| DA Form 2408-16 | Aircraft Component Historical Record            | To record historical data about aircraft components.                                                                                                                                                                       | Permanent record in aircraft logbook; accompanies component on transfer.                                                                                                                                                                                               |
| DA Form 2408-17 | Aircraft Inventory Record                       | Lists all property assigned to an aircraft; used to record periodic inventories of property.                                                                                                                               | A permanent part of the aircraft logbook.                                                                                                                                                                                                                              |
| DA Form 2408-18 | Equipment Inspection List                       | To record most inspections on aircraft and components; provides record of component replacement.                                                                                                                           | Permanent record in logbook; accompanies aircraft on transfer.                                                                                                                                                                                                         |
| DA Form 2408-19 | Aircraft Engine Turbine Wheel Historical Record | To determine whether the turbine wheel can be overhauled or not and which of its parts should be replaced.                                                                                                                 | Retained with the turbine wheel throughout its service life.                                                                                                                                                                                                           |

Not all DA maintenance record forms are found in the logbook. Such forms include the Exchange Tag, DA Form 2402, which is discussed in chapter 6; the Equipment Inspection and Maintenance Worksheet, DA Form 2404, which is used by the operating unit and the support maintenance shop and is mentioned in chapter 9; and DA Forms 1352, 1352-1, 2405, 2407, 2407-1, 2410, 2410-1 which are discussed in the following paragraphs.

**Maintenance Request Register, DA Form 2405.** This register is a managerial tool. It is used to record and control work received and processed as a result of maintenance requests (DA Form 2407) and component removal and repair/overhaul records (DA Form 2410). All requests are entered on this form, regardless of whether or not actual repair is accomplished locally. If, after inspection, evacuation is decided upon, such disposition may be recorded in the remarks column. The form identifies each maintenance request and indicates nomenclature of the item(s) and the requesting unit. It indicates date of receipt and, when completed, dates that repairs were started and completed and the man-hours expended. When completed, this form may be used as a source document for information required by all levels of command (for example, backlog, jobs in progress, and man-hours expended).

**Army Aircraft Inventory, Status, and Flying Time, DA Form 1352.** Every day, important decisions must be made on the effective employment of Army aviation resources. Effective management of Army aviation assets requires accurate and timely reports as a basis for decision making. One of the most important of these reports is the DA Form 1352. The 1352 provides information pertinent to inventory, assignment, status, and operational data on standard and non-standard Army aircraft. The report is prepared monthly in accordance with AR 95-33.

**Daily Aircraft Status Record, DA Form 1352-1.** This form is prepared by all organizations required to submit DA Form 1352. Because of the importance of the 1352, it is mandatory that accurate daily records be maintained on aircraft readiness figures at the end of the month. The 1352-1 provides

accurate daily data and reduces workload requirements. When these daily records are consolidated at the end of the month, they provide the data needed for accurate preparation of DA Form 1352. The report will be prepared daily in accordance with AR 95-33.

**Maintenance Request, DA Form 2407.** This form has three sections; one is the maintenance request, one is a record of work accomplishment, and one is the equipment improvement recommendation. The form has five copies. Copy 1 is the receipt; copy 2 is forwarded to the Commander, US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM), 4300 Goodfellow Boulevard, St. Louis, MO 63120; copy 3 is the control copy; copy 4 is for the organization; and copy 5 is filed. At AVIM level, the form is used for requesting repairs and MWO compliance on end items, components, and assemblies. The report is also used to report completion of maintenance and MWO. Warranty claims are also submitted on this form by all levels of maintenance. When the form is used for a warranty claim, a W is put in the equipment improvement recommendation (EIR) space in the heading on the form. This form is used for collecting, processing, and reporting all maintenance actions and services performed on aircraft systems and components thereof.

**Maintenance Request--Continuation Sheet, DA Form 2407-1.** This form will be used whenever the number of the required entries exceeds the space provided in sections I, II, and III of the 2407. It can also be used for parts predetermination by support maintenance activities and for control of components within a supporting maintenance complex. For preparation procedures, see TM 38-750.

**Component Removal and Repair/Overhaul Record, DA Form 2410, and Component Removal, Installation, Movement, and Condition Record (Trans Report), DA Form 2410-1.** The 2410 is a six-copy manifold form used to provide repair, control, and historical data for designated reportable items, whether installed or uninstalled. Among the reportable items are aircraft time

change and condition items. The 2410 is filled out when a reportable item is initially placed in the Army inventory or lost to inventory; when it is removed from an end item, component, or assembly and not replaced on the same one; when the serviceability status of an uninstalled reportable item changes for any reason; or when the national stock number changes as the result of an MWO compliance. Detailed instructions for preparation and disposition of the 2410 and 2410-1 are contained in TM 38-750.

The 2410-1 records and reports identification, location, and current serviceability status of selected aviation items (TB 55-1500-307-24). DA Form 2410-1 is a postcard pre-addressed to TSARCOM, ATTN: DRSTS-SPFF(2). It is used when an uninstalled item is shipped anywhere or received from any source; each time an item is removed from or installed on an aircraft; each time an item changes condition, whether installed or uninstalled, or is lost to the inventory.

Equipment Inspection and Maintenance Worksheet, DA Form 2404. This form is used to record equipment faults and deficiencies when aircraft are subject to technical inspections before entry into the maintenance shop for performance of maintenance. It is also used for performance of final technical inspections. It is not used when performing daily inspection of aircraft as prescribed by TM 55-1500-series. See TM 38-750 for additional details.

## **PUBLICATIONS AND REGULATIONS**

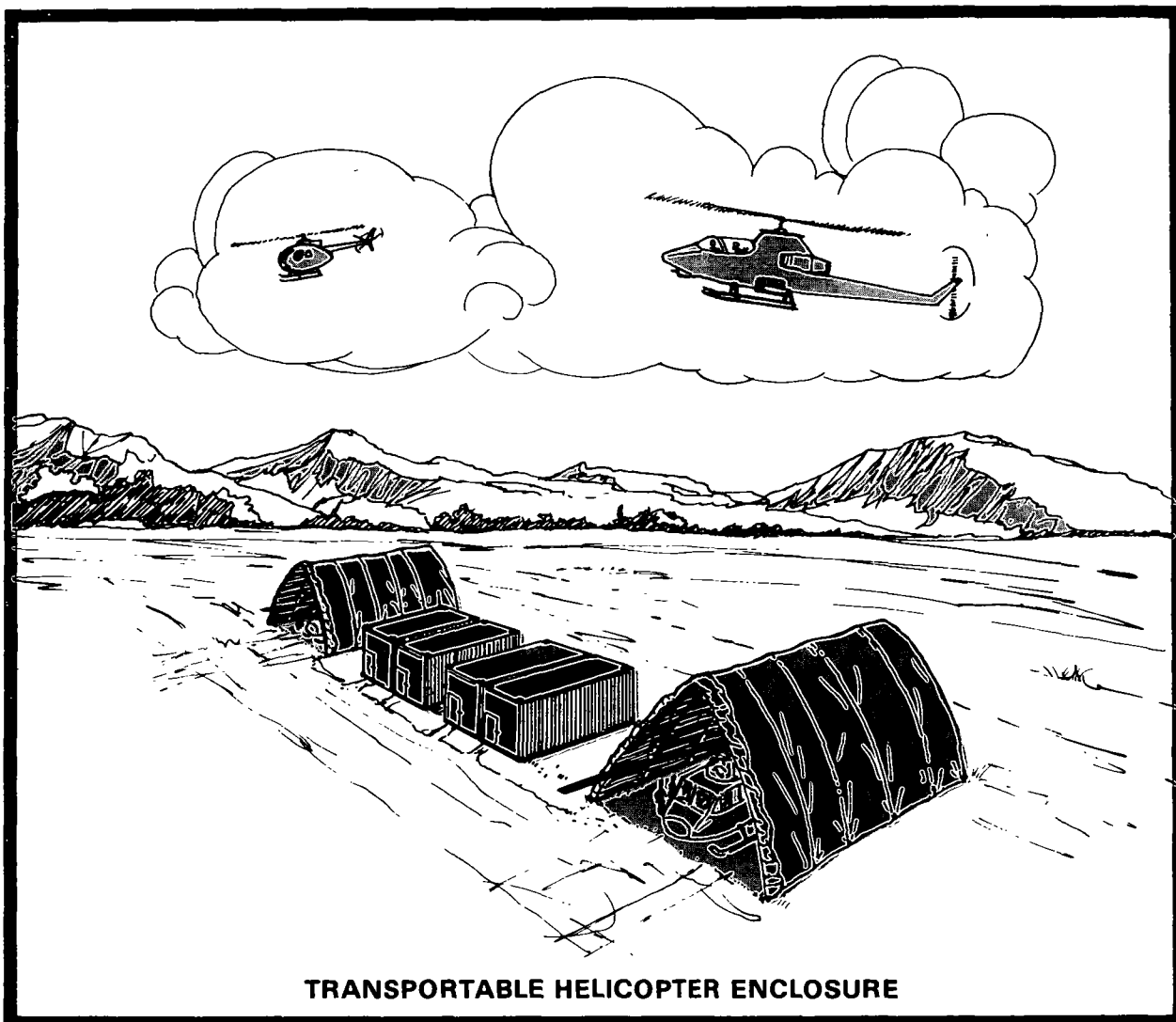
Technical publications provide guidance in the use and operation of end items of equipment, allied equipment, and accessories. These publications include technical manuals, technical bulletins, lubrication orders, and modification work orders. They provide specific instructions on the operation, maintenance, repair modification, serviceability standards, testing, storage, issue, and inspection of equipment and procedures. The quality control section maintains a library containing major publications. Publications are listed in DA pamphlets of the 310-series.

Regulations of the 750 series govern maintenance of supplies and equipment. The quality control section should obtain and use those regulations pertinent to and governing maintenance operations. DA Pamphlet 310-1 lists regulations pertinent to maintenance operations in general, and maintenance policies and procedures including maintenance expenditure limitations, inspections, and reports pertinent to equipment supported.

## SHELTERS

Several shelters are currently being developed that will make the performance of night maintenance much easier. One such shelter is as follows.

***Transportable Helicopter Enclosure (THE).*** Look at the illustration below. This shelter was designed for use at the AVUM level for the OH-58, UH-1, UH-60, and AH-1G.



## SITE SELECTION

Usually, an aviation support commander decides on the general location of a maintenance site. Commanders of units of aircraft maintenance battalions select specific areas for their unit operations within the overall area selected for AVIM operations. An AVIM commander thinks about many things before making site decision; here are a few.

- The area must be near a main supply route and have some roads. (Most AVIM unit vans and trucks are heavy and have little offroad capability. Also, a large amount of traffic will be made up of trucks with heavy loads moving in and out of the maintenance site.)
- The area must be in a position where the AVIM unit can provide support. (An aircraft maintenance company needs many parts and supplies for its own use and for its supported units. So, the area must be close enough to supported units for fast, effective support and far enough away to concentrate on its primary mission.)

**Map, Aerial, and Ground Reconnaissance.** The battalion commander normally assigns a general area by drawing a "goose egg" on the map, within which the maintenance area is to be located. Then the most suitable site within the drawing must be selected by reconnaissance. Three types of reconnaissance used are map, aerial, and ground. Map reconnaissance is made first. From a tactical map, the company commander can select tentative areas for closer evaluation. He can pick routes over which the unit is likely to travel. Next he can make an aerial reconnaissance to check the size, suitability, natural cover, and road network of each possible site and to eliminate the undesirable areas. Finally, the company commander should make a ground reconnaissance of each of the remaining proposed areas and then select the best of them for the unit location. He takes with him any or all of the following: the executive officer, the aircraft maintenance sergeant, and the platoon representatives.

### *Desirable Elements in Site Selection.*

An ideal site for a maintenance area has specific attributes, described in the following subparagraphs. All of these are seldom present, but they should be looked for.

- An airstrip must be available near the unit location, and it must be big enough for the largest aircraft supported. Further, the ground must be able to bear the pressure of the aircraft.
- Woods are important, with existing roads leading into them and going through them. They provide concealment. Drainage must be investigated to make sure the area will not turn into a swamp during rainy weather. Open fields should be avoided, and vehicles should not have to cross them to reach any part of the company area. Tracks of aircraft and vehicles on bare, cultivated, or grassy ground show up from the air and indicate that the area is occupied.
- The area should be located near a main supply route, with existing roads leading into the storage and issue and the shop sections and with access routes for the maintenance platoons. A complete turnaround would be used to have the traffic proceed directly through the area. Some things to consider when selecting a site are listed below.
- Is the site fairly flat?
- Will the surface material support operations in all kinds of weather?
- Will the site accommodate unit vehicles and shop facilities?
- Is there suitable aircraft parking space?
- Will aircraft operations interfere with maintenance functions?
- Does the site provide ready access to the external road net and landing areas?
- Is the site large enough to accommodate dispersion requirements?
- Is there a suitable aircraft landing area nearby?

After an area has been selected, an advance party is sent to organize it. The advance party may be commanded by the executive officer, one of the senior platoon leaders, or a warrant officer. Each platoon or major section of the company furnishes representatives for the advance party. These individuals select locations for the elements they represent. Members of the advance party act as route and area guides when the company moves to the area.

*Purpose of Area Organization.* Efficiency is the primary purpose of organizing the company elements within the selected area. The work areas and facilities must be located for the most efficient workflow without loss of time. An organization for the most efficient operation may have to be modified somewhat because defense must be planned for also. Elements of the company must be placed so that they can defend themselves and help other elements within the unit.

*Layout of the New Area.* The illustration that follows (page 4-19) shows an imaginary site that has been selected by the ground reconnaissance party. Each of the AVIM company elements is located at its particular spot.

First, the airfield should be located in the only large open area on the map, in the open field.

The production and quality control elements should be located near each other and the aircraft maintenance sergeant should be located near the airfield and the maintenance area. He needs to be close to the airfield so that he can direct customers to the correct place and prevent unnecessary wandering through the area. Also, he needs to be close to maintenance so he can supervise all the operation. The quality control office also should be near the maintenance area.

The storage and issue section should be close to the airfield to provide easy access for customers. Moreover, it should have enough space to allow necessary dispersion. It should be near a road to accommodate vehicular traffic, mostly big trucks belonging to both supporting and supported units. Further, the section should be near the outer boundary of the area to minimize traffic through the maintenance area.

The shop platoon headquarters should be near production control since the two offices coordinate their work and exchange work requests, orders, and information.

The shop sections should be away from the airfield so that dust, dirt, and rotor and propeller blast do not blow into the maintenance vans. They should be convenient to customers because any contact between the shop platoon and its customers should be made through the production control office.

Each maintenance section should be located in an area large enough for dispersal of its heavy equipment. One of the sections might be close to the airfield or shop area to help with company maintenance. They should be near a road because they will be moving in and out.

The shop supply section handles repair parts and tools for the shop section and the maintenance platoons and should be near them. It also deals with the storage and issue section and should be near it, too.

The supply platoon headquarters should be located close to its two sections to assist in control and supervision. It too should be near production control for ease in coordination.

The avionics/armament platoon is located with the shop section where the allied trade shops are. The electronics shop semitrailers are kept as near the allied trade shops as is advisable under the particular combat circumstance.

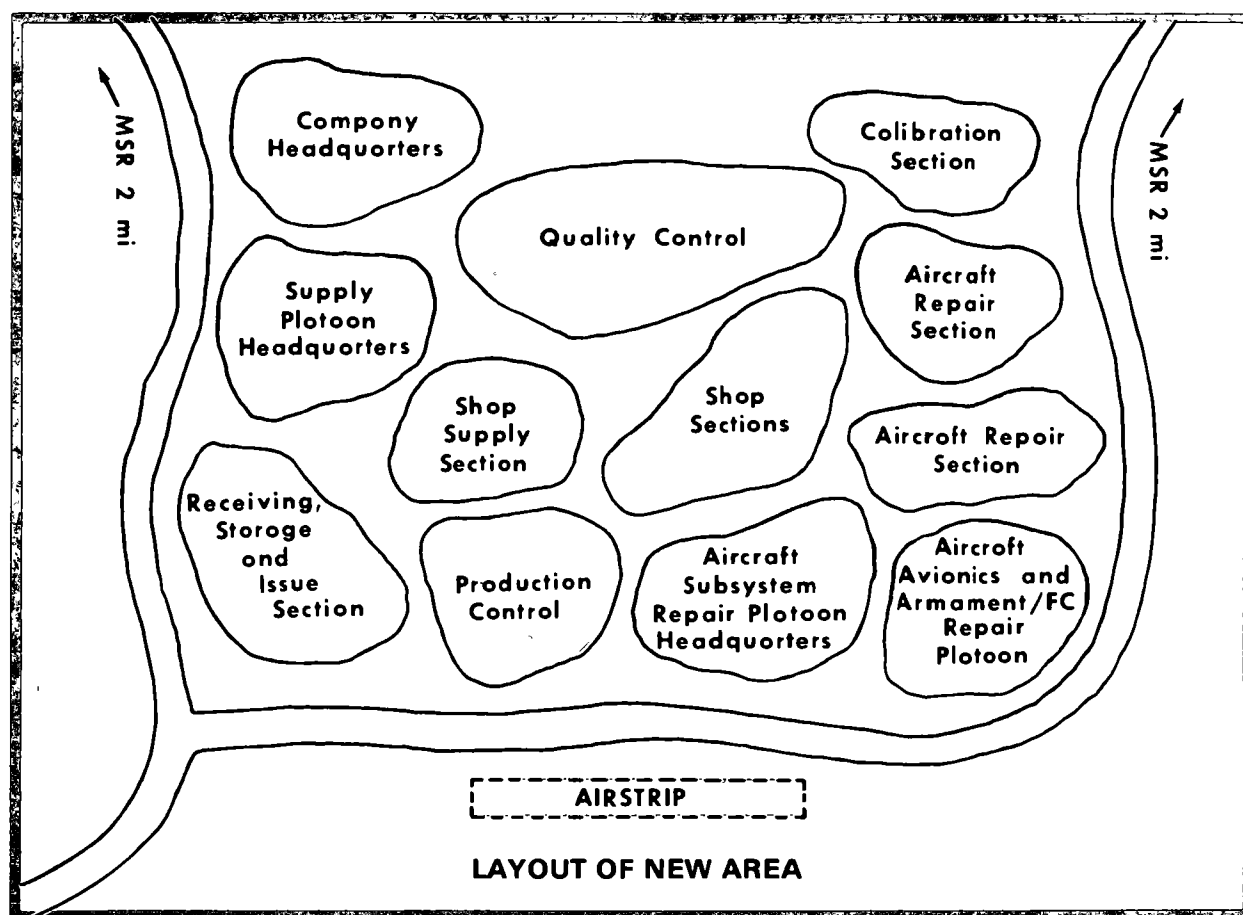
The company headquarters element is responsible for overall company operations. It performs organizational maintenance on all company equipment except assigned aircraft which is performed by the crew chief and repairer assistants.

The unit will be augmented with a heavy helicopter repair section, fixed-wing repair section, and an additional avionics repair section, should they be required to support CH-54 helicopters and/or OV-1 and U-21 aircraft. These sections should be located with the shop platoon and avionics/armament platoon elements as close to the airfield as possible.



## DEFENSE OF THE UNIT

During the selection and organization of the unit area, the commander and his subordinates must keep in mind how the area is to be defended. The unit must be prepared to defend against enemy raids, guerrilla or partisan attacks--against small arms, automatic weapons, mortar and artillery fire, explosives, and fire and air strikes. Foxholes, shallow trenches, and bunkers are the principal means of protection. They should be dug close to working areas. The unit has the ability and weapons to defend itself. However, maintenance work must be done and the unit must somehow manage both defense and maintenance. Principles of defense have been developed to be used as guides during selection of the area and its occupation. Commanders will insure that their defensive positions are coordinated with adjacent units.



*Proper Use of Terrain.* The unit area should not be surrounded by key terrain (hills, rivers, roads, bridges) because this would require manning observation. Good fields of fire are important to the maintenance organization but they are also important to the enemy for use against the unit. Cover is the protection from the effects of enemy weapons. It is provided by the passive defense measures such as locating in woods and camouflaging the unit. Obstacles are the natural or artificial means of impeding the advance of enemy troops. Natural ones, such as swamps, lakes, rivers, and steep slopes should be used as much as possible. Minefields, barbed wire, and roadblocks should be used carefully so as not to restrict movement of the unit but still to harass and block the enemy. Barriers and defense should be concentrated at avenues of approach.

*Security.* By giving early warning of enemy activities, security prevents surprise and gives time to carry out unit defense plans. Security detachments and patrols are not always practical or possible but mines, trip flares, sensors, and boobytraps are examples of devices that can provide early warning of enemy proximity. Internal security, if properly planned, will allow for easy customer contacts and prevent unnecessary machinery in the area.

*All-Around Defense.* The company must be prepared to defend itself in any direction from land or air forces and airborne airmobile raids. Moreover, support from and to adjacent units is planned for, as is support among the elements of the maintenance unit itself. Defense in depth with a mobile reserve is the basic principle to be employed. A perimeter defense with maximum security during the hours of darkness is employed to prevent infiltration by the enemy with explosive charges.

*Fire Planning.* A fire plan must be developed to include all the weapons available to the company, both individual weapons and those served by a crew. Each individual must know his assigned weapons and those served by a crew, and he must know his assigned sector and his final protective fire areas. This information should be set forth on a range card for each position.

Interlocking fire should be organized within the unit and with adjacent units. Use of a grenade launcher and any supporting artillery should be planned for, and fire lanes may have to be cut to give good grazing fire (parallel to the ground, not above the height of a standing man).

*Coordination and Flexibility.* All personnel in the unit must be familiar with the defense plan. Adjacent units must know the company defense plans, and the company must also know theirs. Few things go exactly as planned so the defense plan must be flexible to adapt to any situation. The defense must always be planned to be effective while allowing the unit to accomplish its maintenance support mission.

*Passive Defense.* Camouflage and dispersion are two important passive defense measures. Use of revetments to afford protection to individual aircraft and to minimize effects of fire and secondary explosions is also an important means of passive defense. Camouflage is needed the most in flat, barren country and the least in wooded areas and hilly country. Camouflage nets should be used. Camouflage discipline must be maintained both within and near the maintenance area. Vehicles must not be permitted to park in exposed areas or be allowed to make new trails of tracks into the sea.

In a combat zone, supporting units may be expected to move often and quickly. Most important in moving a maintenance company is uninterrupted service with the least inconvenience to the supported units. Planning before the next move prevents confusion. Detailed plans for moving the unit should be included in its standing operating procedures (SOP). Loading plans should be included with the march order sequence; the air-ground chemical, biological, and radiological (CBR) defense plans; and the night movement control measures. All of the movement planning should be tested.

The plans should be coordinated with the supported units and operations elements of the command to keep them current and obtain the best quality.

**Advance.** In a move toward the front lines, the company commander probably cannot move his entire organization at one time. Probably aircraft are in the shop in various stages of maintenance that must be completed. It may be possible to fix the aircraft enough for a onetime flight to the new area or to move them by truck, but usually personnel and equipment are left at the old site to work until the new shop location is organized and supported units are using it.

**Retrograde.** A retrograde movement is

more urgent than a forward move, and personnel and equipment cannot be left behind. Everything must be moved to the rear with the least possible delay using additional transportation. Aircraft in maintenance can be prepared for a onetime flight and flown to a new location, moved by air or surface vehicle, or destroyed. Equipment is never just abandoned. If equipment and aircraft cannot be evacuated, they are immobilized or destroyed. Procedures for the destruction of abandoned equipment are contained in TM 750-4405.

## SUMMARY

From what you have read about aviation maintenance operations, here are some important points you should remember:

- Close coordination between supported units and supporting maintenance units will eliminate many difficulties.
- Operational readiness float aircraft are maintained to provide replacement for unserviceable aircraft.
- With bay shop production method the aircraft to be repaired remains in one shop location until the work has been completed; bench shops repair small items using a high degree of technical skill and using equipment mounted in a shop vehicle.
- Production control elements vary from one maintenance activity to another. Space and facilities available plus geographical location and the number and type of equipment being maintained are considerations that lead to a decision about what kind of production control to be used.
- Quality standards must never be sacrificed if the only reason for such a decision is to increase production.
- Night maintenance will be a requirement in a theater of operations. Such maintenance will be used to correct maintenance backlogs, prepare aircraft for the next day's flights, and prepare for frequent moves or displacements.
- Three types of reconnaissance are used to select a site: map, aerial, and ground.

So much for aviation maintenance operations. Now, let's take a look in the next chapter at an important phase of such operations--calibration.



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## CHAPTER 5

# CALIBRATION

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### WHY CALIBRATE ?

The Army calibration system is designed to insure the accuracy of test and measuring equipment used in maintaining aircraft (and all other Army materiel). The system requires that the accuracy of Army test and measuring equipment and calibration standards be referenced to the measurement standards maintained by the National Bureau of Standards. This referencing is managed by the Army Metrology and Calibration Center (USAMCC), Redstone Arsenal, Alabama. See FM 29-27, AR 750-25, and TB 43-180 (the primary reference standard) for details on calibration. This chapter covers:

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| RESPONSIBILITIES .....              | 5-2  |
| CALIBRATION FORMS AND REPORTS ..... | 5-3  |

## HOW IT IS DONE

Each using or maintenance organization is provided with either the capability of the support necessary to maintain and assure the accuracy of its assigned test and measuring equipment.

Test and measuring equipment at aviation unit maintenance (AVUM) level is calibrated by aviation intermediate maintenance (AVIM) activities. Such calibration is termed C-level or maintenance calibration and is performed through the use of calibrated test and measuring equipment of the maintenance activities. When calibration is not within the capability of the AVIM unit, it will be done by a calibration team of the Army calibration company as described by FM 29-27. The Army calibration company performs A-level calibration using secondary transfer or secondary reference standards. Organizational equipment requiring calibration team support is taken to an AVIM unit for calibration during the calibration team's scheduled visit. When the size or construction of the equipment precludes easy movement, the calibration team will be sent to the equipment site.

C-level calibration is provided by AVIM units

A-level calibration is provided by a team from the Army calibration company

(There is no B level)

## RESPONSIBILITIES

Some items, as indicated in TB 43-180, require only maintenance calibration. This is done by the maintenance unit using test and measuring equipment which has been calibrated by a calibration company. AVIM units are responsible for calibrating items organic to their own organization and those within supported units. The responsibilities extend to all items of test and measuring equipment that do not require A-level calibration by the calibration company. Maintenance calibration is done by AVIM units as frequently as stipulated in TB 43-180,

as well as after the repair of supported unit test and measuring equipment. Maintenance calibration by an AVIM unit requires certification and documentation as indicated in TM 38-750.

ITEMS WITHIN THE ARMY INVENTORY WHICH REQUIRE CALIBRATION ARE LISTED IN TB 43-180.

AVIM units are also responsible for--

- Coordinating calibration scheduling with supported units.
- Providing a 7-day advance notice of scheduled visits by secondary reference transfer calibration teams of the supporting calibration company.
- Evacuating to the calibration company those items requiring calibration by a secondary reference calibration section.
- Rescheduling, when scheduled calibration interferes with the operational mission of using units.

Test and measuring equipment requiring calibration by a calibration team and which has been repaired by a maintenance support unit before or during a visit by a team from the calibration company will be calibrated by the team during its visit. The Army calibration company provides oncall calibration when operational requirements indicate the need for A-level calibration before that next scheduled visit by the team.

Using units are responsible for assisting calibration teams when their equipment must be calibrated onsite. Using units are also responsible for transporting to their supporting AVIM unit that equipment requiring calibration by their supporting maintenance units or calibration teams. They are also responsible for adhering to schedules established by the supporting maintenance unit for calibration, for insuring that all equipment requiring calibration is presented for calibration by the supporting maintenance unit or calibration team, and for informing the maintenance unit when

calibration schedules interfere with the operational mission. Equipment requiring calibration, the calibration interval, and the level at which calibration must be accomplished are described in TB 43-180.

## CALIBRATION FORMS AND REPORTS

**Calibration Data Card (DA Form 2416).** This form as shown below is a record of items requiring calibration. It provides a means for scheduling calibration and a report of calibration accomplishments. For specifics on use of this form, see TM 38-750.

|                                                                                                                                                                                                   |  |                                |  |                                  |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------|--|----------------------------------|--|---------------------------------------------------|--|-----------------------------------|--|-------------------------------|--|-------------------|--|--------------------------|--|-----------|--|--|--|------------------|--|--|--|--------------------|--|--|--|-----------------|--|--|--|
| 1 WFO CODE<br><b>AN</b>                                                                                                                                                                           |  | 2 MODEL NUMBER<br><b>URM61</b> |  | 3 NOMENCLATURE<br><b>GEN SIG</b> |  | 4 FEDERAL STOCK NUMBER<br><b>6625-00-512-2056</b> |  | 5 REP<br><b>1</b>                 |  | 6 LEV<br><b>A</b>             |  | 7 INT<br><b>C</b> |  | 8 SYS CODE<br><b>N00</b> |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| 9 SERIAL NUMBER<br><b>46651123</b>                                                                                                                                                                |  |                                |  | 10 LINE NUMBER<br><b>J 53371</b> |  | 11 OTHER UIC<br><b>W121A1</b>                     |  | 12 WORK CTR/TEAM<br><b>WIPLIK</b> |  | 13 SUPPORT UIC<br><b>7340</b> |  | 14 DUE DATE       |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| 15 CONDITION                                                                                                                                                                                      |  |                                |  | 17 PARTS ADJUSTED                |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| <input type="checkbox"/> <b>A</b> WITHIN TOLERANCE<br><input type="checkbox"/> <b>B</b> OUT OF TOLERANCE                                                                                          |  |                                |  | 18 PARTS REPLACED                |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| 16 REPAIR ACTION                                                                                                                                                                                  |  |                                |  | 19 REMARKS                       |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| <input type="checkbox"/> <b>A</b> REPAIRED BY CALBR TEAM LAB<br><input type="checkbox"/> <b>B</b> REPAIRED BY SUPPORT MAINT<br><input type="checkbox"/> <b>C</b> NOT REPAIRABLE THIS STATION/TEAM |  |                                |  |                                  |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| 20 TYPE OF STANDARDS                                                                                                                                                                              |  |                                |  |                                  |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  | 21 UPDATE |  |  |  | 22 CHANGE DATA   |  |  |  |                    |  |  |  |                 |  |  |  |
| MICRO                                                                                                                                                                                             |  |                                |  | OCAL                             |  |                                                   |  | MECH                              |  |                               |  | I R               |  |                          |  | RAD       |  |  |  | ADD              |  |  |  | CHANGE             |  |  |  | DELETE          |  |  |  |
| A                                                                                                                                                                                                 |  |                                |  | B                                |  |                                                   |  | C                                 |  |                               |  | D                 |  |                          |  | E         |  |  |  | A                |  |  |  | B                  |  |  |  | C               |  |  |  |
| HR                                                                                                                                                                                                |  |                                |  | Y                                |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |
| 23 REPAIR M/N                                                                                                                                                                                     |  |                                |  | 24 INITIALS                      |  |                                                   |  | 25 CALBR DATE                     |  |                               |  | 26 CALBR M/N      |  |                          |  | 27 PRI    |  |  |  | 28 WORK CTR TEAM |  |  |  | 29 WORK REQUEST NO |  |  |  | 30 ANSWERS CODE |  |  |  |
|                                                                                                                                                                                                   |  |                                |  |                                  |  |                                                   |  |                                   |  |                               |  |                   |  |                          |  |           |  |  |  |                  |  |  |  |                    |  |  |  |                 |  |  |  |

REPLACES PREVIOUS EDITION, WHICH IS OBSOLETE.

Report Control Symbol  
CSGLD-1201

CALIBRATION DATA  
(TM 38-750)

DA FORM 2416, 1 JAN 70

**CALIBRATION DATA CARD, DA FORM 2416**

**US Army Calibration System Rejected Instrument (DA Form 2417).** This tag as shown below identifies the item as either unserviceable or available only for limited use. The calibrating unit that determines the item is unserviceable removes the frontal sheet of DA Form 2417 and delivers it to the responsible property or maintenance officer. The cardboard backing of the tag is attached to the item and remains until the necessary maintenance and calibration are performed. The calibration certification label is voided. After maintenance and calibration, the tag is removed and another certification label applied. This indicates that the item is again certified for use. For specifics on this form see TM 38-750.

| DA FORM 2417<br>1 JAN 70                              |                  | REPLACES PREVIOUS<br>EDITION, WHICH IS<br>OBSOLETE. |  |
|-------------------------------------------------------|------------------|-----------------------------------------------------|--|
| UNSERVICEABLE OR<br>LIMITED USE TAG (TM 38-750)       |                  |                                                     |  |
| 1. OWNER UIC                                          | 2. SUPPORT UIC   |                                                     |  |
| WAX00H                                                | WB123C           |                                                     |  |
| 3. MFR & MODEL/<br>JAN TYPE                           | 4. SERIAL NUMBER |                                                     |  |
| 80009-524D                                            | 042-024-05       |                                                     |  |
| 5. NAME                                               | 6. DATE          |                                                     |  |
| LA. FOX                                               | 17 MAR 78        |                                                     |  |
| 7. <input checked="" type="checkbox"/> UNSERVICEABLE  |                  |                                                     |  |
| 8. REMARKS                                            |                  |                                                     |  |
| FREQUENCY<br>SENSITIVITY                              |                  |                                                     |  |
| 9. <input type="checkbox"/> LIMITED USE               |                  | 10. EXPIRATION DATE                                 |  |
| 11. <del>DO NOT USE</del>                             |                  |                                                     |  |
| PARAMETER                                             |                  | RANGE                                               |  |
| 12. SUPERVISOR AUTHORIZING LIMITED USE<br>(SIGNATURE) |                  |                                                     |  |
| (DETACHED FROM DA FORM 2417)                          |                  |                                                     |  |

REJECTED INSTRUMENT TAG, DA FORM 2417



***US Army Calibrated Instrument (DA Label 80).***

The DA Label 80 shown here is used to--

- Identify an item that has been calibrated to the required accuracy.
- Indicate the date the item was calibrated and the date when the next calibration is due.
- Identify the person and the unit performing the calibration.
- Identify an item that has been calibrated to required accuracy.

After calibration has been accomplished, the DA Label 80 will be placed on the item where it can be seen. Previous labels will be avoided or removed and destroyed.

| U. S. ARMY CALIBRATION SYSTEM (TM 38-750)      |                                   |
|------------------------------------------------|-----------------------------------|
| 1. JAN TYPE/MFR & MODEL<br><b>TS-352 B/U</b>   | 2. CALBR DUE<br><b>20 APR 78</b>  |
| 3. SERIAL NUMBER<br><b>4 132</b>               | 4. DATE CALBR<br><b>10 DEC 77</b> |
| 5. NAME/REPORT NUMBER<br><b>I.M. CERTIFIED</b> | 6. SUPPORT UIC<br><b>WLEX 04</b>  |
| DA LABEL 80 ----                               |                                   |

**CALIBRATED INSTRUMENT LABEL , DA LABEL 80**

### SUMMARY

Out of your reading about calibration should have come these important thoughts:

- Calibration insures the accuracy of test and measuring equipment used in maintaining aircraft.
- TB 43-180 is the primary reference for finding out which items require calibration.
- AVIM companies perform C-level calibration.
- AVIM companies coordinate calibration scheduling with supported units.
- TM 38-750 gives specific uses of DA Form 2416, Calibration Data Card.
- DA Label 80 is used to identify an item that has been calibrated to the required accuracy.

The next subject that concerns AVIM units is repair parts supply. You will find a discussion of that subject in the next chapter.

## CHAPTER 6

REPAIR PARTS SUPPLY

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Repair parts are a major item in the supply field. Managing repair parts is a responsibility of the aircraft maintenance officer. And, when necessary, he must be able to supervise the supply functions.

Maintenance people and supply people differ in their reasons as to why they are sometimes unable to provide the services expected of them; however, they agree that the ultimate aim of both is to make sure the right supplies are on hand when needed, and in the right quantities to do the job. This chapter covers these agreements in the following subjects:

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| SUPPLY OPERATIONS .....                                                   | 6-2  |
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## INTERRELATIONSHIP OF MAINTENANCE AND SUPPLY

Planning for supply and maintenance must be concurrent, closely coordinated, and realistic with respect to current consumption rates. While an inadequate maintenance organization increases supply requirements, maintenance cannot operate efficiently without a good supply system. Each depends upon the other. Proper maintenance of equipment increases its period of economical usefulness, reduces supply requirements for replacement of equipment, and thereby conserves resources.

The provision of supplies carries with it the added responsibility of assuring that the material is used wisely. Supply economy, control, and conservation must be practiced. Maximum service life must be obtained from each item and accumulation of excess stocks must be avoided. Reclamation and repair of serviceable items will be used as a source of repair parts supply whenever feasible. Positive steps must be taken to prevent damage to items in storage and in transit. Both serviceable and unserviceable items are often subject to mishandling, thus increasing the maintenance workload. Overall policies and procedures on supply economy are established by higher headquarters and must be conformed with. The aviation intermediate maintenance (AVIM) units assist in implementing these policies and procedures for items they provide supported units by furnishing logistical assistance personnel.

A direct support system (DSS) provides increased supply efficiency and asset visibility through the use of palletized cargo for air shipment and containerized cargo for sea shipment. Thus, maintenance and supply interrelate in terms of supporting the Army in the field. Specific details concerning DSS are found in DA Pamphlet 700-22, Logistics: Direct Support System.

## SUPPLY OPERATIONS

The supply function within the aviation maintenance units may be grouped under three headings-organization (unit) supply,

shop supply, and technical supply. Shop and technical supply are defined briefly as follows:

*Shop Supply* provides repair parts, assemblies, components, and other supplies needed by the AVIM companies' maintenance and repair elements to accomplish their mission. Although the internal source of these supplies is the company's technical supply element, the shop supply activity directly serves the maintenance shop.

*Technical Supply* includes all those operations required to obtain, account for, store, and issue repair parts, maintenance supplies, and operational readiness float items needed by supported units and the maintenance shops. It is found only in AVIM aircraft maintenance shops. In the performance of technical supply functions, the basic procedures prescribed in AR 710-2 are followed.

Any organization for supply should include the following elements.

- A system for stocking combat essential items in peacetime for wartime requirements. Theater commanders define combat essential items. The amount stocked should be enough to insure that automatic resupply can sustain the operation until normal wartime supply procedures are established.
- Responsive requisitioning system.
  - An agency at each supply echelon that responds to requisitions by directing issue, placing demands on other agencies, or forwarding demands to a higher echelon.
- An agency to allocate items when there are not enough of them to meet all requirements.
- An inventory control system able to provide current information on amount, location, and condition of stocks on hand; to balance current and anticipated requirements against stocks on hand and on requisition; and to judiciously dispose of excess stocks.

- Personnel and facilities to receive, store, maintain, and distribute supplies and equipment.
- Fast and accurate data processing.

## REPAIR PARTS AND STOCKAGE

Repair parts stockage has always been a concern of the maintenance manager. Maintaining an adequate stockage of proper items can be a problem because of the following variables:

- Fluctuations in demands.
- Transfer of supported units to other areas.
- Changes in mission assignment requiring support of different types of equipment.
- Age of equipment that affects repair and repair parts requirements.
- The requirement to build in adequate safety levels to compensate for order and ship time.

Thus, while some units are overstocked, others experience a supply shortage. Additionally, overstockage can inhibit mobility and must be considered in establishing supply levels.

Staff supervision and periodic inspection of supply procedures of attached units are prime management functions. Battalion policies should emphasize the requirement for review of the prescribed load lists (AR 710-2) of supported units to evaluate proposed additions or deletions. Also it should indicate how to screen supported unit repair parts requests to insure that requested items are authorized. Review of requests for issue can be useful in identifying trends (for example, frequent failures of the same part) which may require increased supply levels and submission of equipment improvement recommendations. Or it may indicate performance of unauthorized maintenance by lower categories of maintenance based on the type of parts requisitioned.

## OPERATIONAL READINESS FLOAT (ORF) EXCHANGE PROCEDURES

Procedures for the exchange of a recoverable or unserviceable reparable end item for a serviceable ORF end item are outlined in AR 750-1 and TM 38-750.

### DIRECT EXCHANGE

Direct exchange (DX) is a supply system at AVIM level designed to expedite the supply of fast moving recoverable/reparable items (repair parts, modules, components, or assemblies) by exchanging serviceable for unserviceable items on an item-for-item basis. DX eliminates the need of a request for issue or turn-in. The DA Form 2402 (Exchange Tag) can be prepared and hand-carried along with the unserviceable items direct to the DX section for exchange for serviceable items.

Direct exchange is an accelerated supply transaction by which a supported unit turns in an unserviceable item and receives a serviceable item in exchange.

**Authorized DX Items.** Items authorized for DX normally are limited to--

- Repair parts and assemblies annotated with R, S, and T in the recoverability column of the appropriate DA technical manual of the -20 or -35 P-series.
- Minor secondary items authorized for supported units.

**Items Selection.** Items selected for DX are determined by a joint and coordinated effort of maintenance and technical supply personnel. The object of this coordinated effort of maintenance is to insure that items have experienced sufficient demands to qualify for the authorized stockage list (ASL) and that the organic maintenance capability exists to repair the items.

**DX Listing.** A DX list containing stock number, item description, end item application, and authorized stockage level is prepared and submitted to the appropriate commander or designated staff officer for approval. Lists of approved items are distributed to all units and activities authorized to use these stocks. Changes to the list or a new list will be published at least quarterly. The officer in charge of the DX activity is responsible for publication of this list.

**Excess Stocks.** Excess DX stocks generated as a result of recomputation of levels may be retained by the DX activity in quantities which can be reduced to the authorized level by attrition (washout) within 90 days. Stocks in excess of the above criteria and all stocks of items deleted from DX lists will be reported.

**Issues.** The DX activity will accept unserviceable items from using units and activities on DA Form 2402 (Exchange Tag) for DX. An item-for-item exchange will be made. If the item becomes unserviceable through other than fair wear and tear, a serviceable replacement will be exchanged provided evidence is presented indicating that--

- Appropriate action is being taken to determine the cause.
- Action is taken to place financial responsibility.

**Disposition of Unserviceable Items.** Unserviceable items received by the DX activity are turned over to the maintenance shop for repair on DA Form 2407, Maintenance Request. Items found to be nonreparable by the maintenance activity will be identified to the technical supply activity for disposition. Items can be sent to contract repair on DA Form 1348-1. A copy of the DA Form 2407, indicating nonreparable condition, can be used as a basis for adjustment of the accountable record to reflect the change in serviceability. Unserviceable items are not permitted to accumulate but are delivered to the maintenance shop within 1 working day from date of exchange.

**Items Due-Out.** When serviceable or substitute items are not available, an informal due-out will be established using DA Form 2402, Exchange Tag.

**Records.** Commanders will assign responsibility for DX to the accountable property officer or to the accountable supply officer. Records maintained for the DX activity will be considered as part of the balance records of the accountable property officer. Stockage levels determined in accordance with these procedures will be considered as part of the ASL. The designated accountable officer will insure that DX assets are included in asset reports as required. Records to maintain balance on hand and to accumulate information as to repair rate, resupply rate, repair cycle time, and order ship time must be maintained on the DX Accounting Record, DA Form 3029R. This form will be reproduced locally on 8- x 8-inch paper for use in visible files equipment. For typical form entries, see AR 710-2. When machine capability is available, DX recordkeeping should be automated to the maximum extent feasible.

**Stockage Level.** Stockage level of an item authorized for DX is the sum of total repair cycle requirement, resupply level quantity, and a 25-percent safety factor. Stockage level can be obtained through the use of the formula and DX stockage tables discussed in AR 710-2.

## AUGMENTATION OF SUPPLY STOCKS

**Parts Fabrication.** Although fabrication of parts is not a supply procedure, it can often be used to keep equipment operating when repair parts are not available. Both supply and maintenance personnel should remain conscious of their unit capability for fabricating parts and should be informed of the importance of doing so. Caution: Parts should be fabricated only when they cannot be obtained through supply channels. If this control is not exercised, fabrication can be costly in both money and people. Supply personnel should annotate supply records to indicate those parts that can be locally fabricated. They should also maintain demand data on items provided.

**Cannibalization.** Cannibalization involves the removal of serviceable or economically repairable repair parts and assemblies from uneconomically repairable end items, or components thereof, and making them available for reissue. Cannibalization provides many needed repair parts that are not included on stockage lists. It is a source of low mortality parts supply, and serves as an economy measure by the removal and use of repair parts and components from end items which are unserviceable and useful only as salvage.

The practice of cannibalization will be limited to those end items and components which would be disposed of through salvage channels as uneconomically repairable. Normally, repair parts and components will not be removed from items destined for evacuation to higher echelon repair facilities, except in emergencies when the serviceable item so removed is necessary to repair a critically needed item. Also this will happen if the required repair part is not readily available through other sources. In those instances where cannibalization of an item to be evacuated is justified, the serviceable part or component removed from the unserviceable end item must be replaced with a like unserviceable component or part.

Cannibalization policies will be established and procedures supervised by the battalion headquarters of the AVIM maintenance unit. Cannibalization will be performed under the supervision of inspectors who determine the serviceability of each repair part or component. Individual repairmen will not be permitted to remove repair parts for the completion of routine repair job.

When an end item has been cannibalized to the extent that its retention is not economical, disposition will be made to the nearest salvage disposal facility in accordance with prescribed procedures.

Controlled cannibalization may be performed in accordance with the provisions of AR 750-1. When an item is cannibalized, equipment records are annotated as prescribed in TM 38-750.

Accounting procedures and records will be maintained in accordance with AR 710-2.

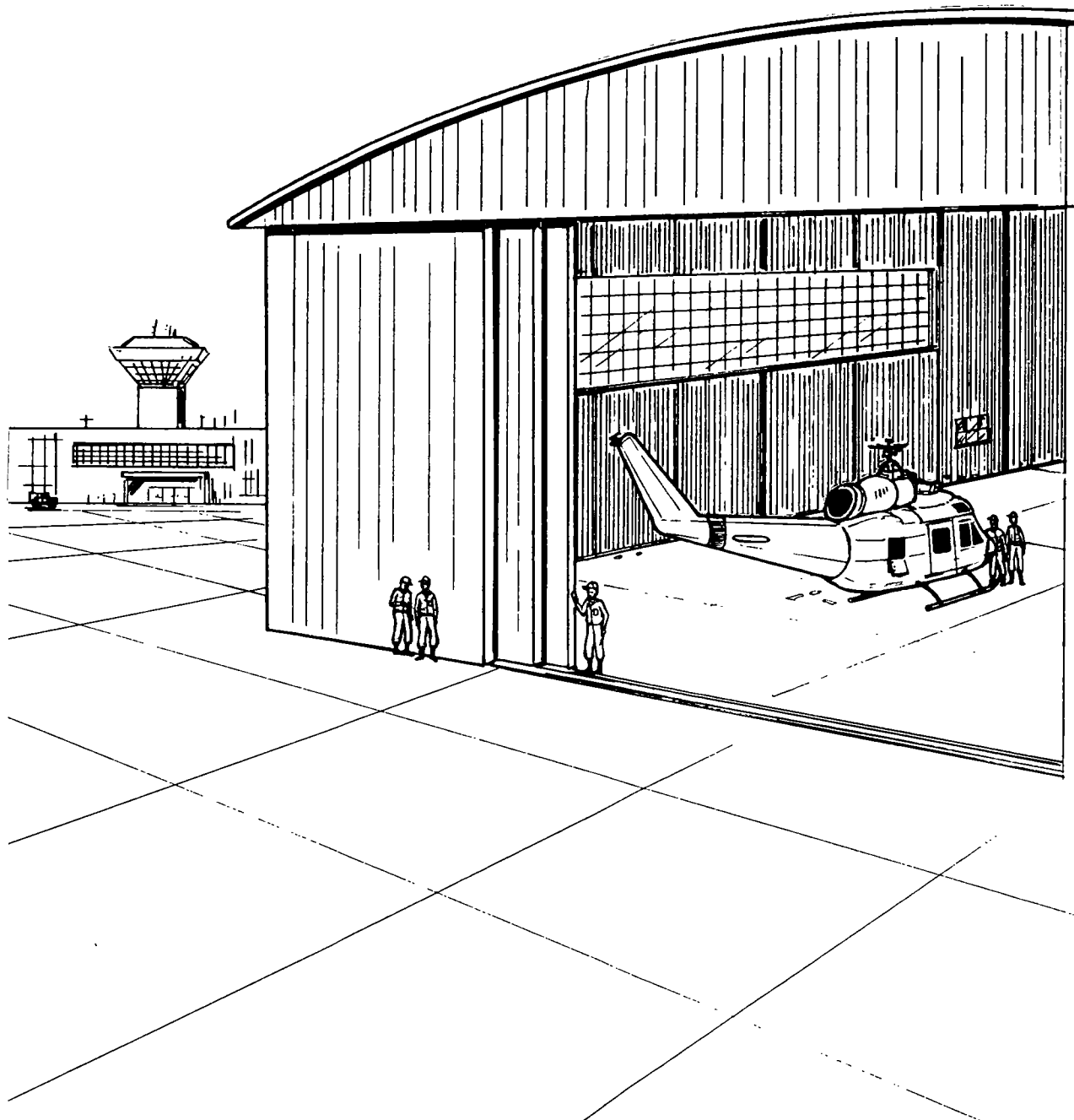
### ***Aircraft Cannibalization.***

Serviceable parts may be removed from one aircraft to provide repair parts for another. The procedure should be approved only when the following criteria have been met:

- The aircraft from which the serviceable parts are to be removed is not operationally ready supply (NORS), damaged, or undergoing extensive maintenance.
- Any additional delay in returning the cannibalized aircraft to serviceability is compatible with its established maintenance priority.
- The aircraft upon which the cannibalized parts are to be used is currently grounded for parts.
- All possible alternative actions (lateral supply, local procurement, and local manufacture) have been tried without success.
- Established maintenance priorities justify giving preferential maintenance to the aircraft for which the cannibalized parts are to be used.
- A complete check of the technical supply suspense file has been made. This will assure that parts for the aircraft from which the cannibalization is going to take place are not due in shortly. This can be ascertained from the AA1, Followup Answer, or AE1, Automatic Status (AR 725-50).

A record of the removed parts is maintained and aircraft records are annotated for each item cannibalized. **Controlled cannibalization must be maintained at all times.** One person should be appointed as the controlling authority. Ideally, this person should be the production control officer who gives prior authorization for removal of any part from an aircraft for the purpose of cannibalization.

**NOTE:** It is not acceptable maintenance practice to create a "Hangar queen." Unauthorized removal of a part from an otherwise flyable aircraft puts that aircraft in the status of a hangar queen.





## HOW TO ASSIST SUPPORTED UNITS ON SUPPLY MATTERS

AVIM units do not merely react to supply requirements of supported units; they assist in determining these requirements, verify these requirements, and satisfy them. AVIM units assist in planning and managing supported units' repair parts stockage. This is accomplished as follows:

**Technical Assistance.** Supported units are provided technical assistance in all phases of organizational repair parts supply procedures (AR 710-2). The assistance includes advice and assistance on determining and modifying prescribed load lists (PLL), advice on preparing and maintaining repair parts records, and advice on determining stock levels (see chapter 8 for technical assistance procedures).

**Review of PLL.** Repair parts stockage at the AVIM level is based on the demands of supported units. The supporting unit reviews PLL of supported units, including proposed additions or deletions from such lists, and maintains a copy of the approved PLL of each supported unit. It is necessary to review recommendations for additions to PLL of supported units to assure that the supporting supply activity is able to satisfy requirements for additions to stockage lists.

**Items Authorized But Not Stocked at Supported Unit Level.** The supporting unit provides stockage support for those items demand supported in accordance with the stockage criteria contained in AR 710-2. Stockage of supplies is based primarily on the frequency of demands for items. Mission essential items will not be stocked at AVIM level unless demand supported. Exceptions to this policy are contained in AR 710-2.

## HOW TO RUN A SHOP SUPPLY

Shop supply is an important aspect of shop operations. A unit with an effective shop supply operation is capable of providing good support to customers. A unit without this type of support is ineffective, regardless of the skill of the mechanics.

## SHOP SUPPLY FUNCTIONS

Shop supply can be defined, for the purposes of this chapter, as liaison between the repairman and the technical supply activity. Unlike most other maintenance units, aircraft maintenance companies are provided an organic shop supply element. This shop supply element is responsible for obtaining, storing, and issuing parts for specific job orders in the shop. It may have responsibility for obtaining, storing, and issuing high demand repair parts (shop stock). The shop supply element is usually located adjacent to the shop office but, under certain circumstances, small shop supply elements may be located in each of the repair sections (aircraft, armament, avionics, etc.). A centralized shop supply element results in economy of personnel and maximum control by the shop officer. The centralized element is less responsive to the needs of the individual shops but increases the availability of common items and reduces lateral search requirements within the company.





One element of information entered on the request form is a document number identifying the transaction. This number consists of the Julian date and a serial number (8249-008, 8249-009, etc.). Occasionally, a shop officer will assign blocks of serial numbers to repair sections within the shop. The latter system is used when the shop supply element is divided among the repair shops. This document number is entered on the Document Register for Supply Actions, DA Form 2064, at the time the requisition is prepared. Basically, this register is a summary of the status of supply action.

The first entry on the document register consists of the priority designator and the Julian date. The priority designator is established from the priority designator assigned by the unit to the maintenance request. The document serial number is entered in the next column starting with the lowest number for the first requisition on that date. Other entries are described in AR 710-2.

The control copy of the DA Form 2407-1 (white copy) is returned to the shop office by the shop supply element. Here it is filed with the basic Maintenance Request, DA Form 2407, as a voucher indicating that shop supply action has been taken on the requirement for repair parts. The remaining copies of the DA Form 2407-1 are filed.

Occasionally, a repair part is not available at the technical supply activity. This may be because the part is infrequently used (a nonstocked list item) or the supply activity is temporarily out of the part. In either case, the request is forwarded by the technical supply activity to the supporting repair parts supply activity or stock control center (assuming it is a high priority request). Evidence of this "passing" action is returned to the shop supply element. This is done by returning a copy of the request annotated with a control number assigned the request by the technical supply activity. The returned document is filed in a suspense file in the numerical order of the control number assigned by the technical supply activity, pending receipt of the part. This control number is entered in the transaction register as a convenient means of indicating action by the supply activity. If

requested items are not available through technical supply, other resources of supply should be explored.

The shop supply element has a responsibility to follow up on requests. The exact period of time before a "followup" is submitted will vary from one command to another and according to the priority originally assigned the request. The followup is similar in format to a request. It is identified as a followup action by the code entry AF1 in red letters and circled. This followup action is noted in the document register by entering, in pencil, the notation AF1 and the Julian date in column J.

When the repair part arrives it will be accompanied by a shipping document, DA Form 1348-1. This document can be identified by the technical supply activity. This enables identification of the suspense document since these documents are filed in numerical sequence using the technical supply activity transaction control number. Since the shop supply document number was also written on the suspense document, the transaction can be located in the document register and the part container marked with the job order number to which it pertains. The "quantity" entry on the DA Form 2407-1 may be circled to indicate the part has been received, all remaining copies of the DA Forms 2407-1 are returned to the shop office.

Manually prepared documents were used in the previous transaction. When preprinted documents are used, the procedure is the same. However, the location of the information may vary and the amount of information which must be entered manually is reduced. Preprinted cards have NSN and unit of issue entries completed. In addition, they have been edited previously and no information need be entered relating to publication data.

## SHOP STOCK FUNCTIONS

The repair parts procedures discussed here are for parts intended to be used on a job in the shop. In other words, a requirement for a part existed at the time the request was submitted. Shop stock is intended to meet anticipated requirements for repair parts. Shop stocks require careful control to avoid excess, thus generating a requirement for additional

bookkeeping and personnel. In some instances, stockage of repair parts in the shop supply element may have an adverse effect on the mobility of the unit. On the other hand, stocking repair parts in a shop supply element reduces the number of supply transactions and provides better or more timely response to the demands of the supported units submitting maintenance requests. Shop stocks are particularly advantageous in the armament and avionics commodity areas.

The first source of authority for stockage of repair parts in a shop supply element is the decision of the commander responsible for the operation. Should the commander decide that a shop stock of repair parts is in order, the next step is to determine those parts which have at least three demands in 180 days. These two criteria establish that the part may be stocked, except those parts identified as code F, H, and A in the recoverability column of the applicable repair parts and special tool lists technical manuals.

The next consideration for stockage of repair parts is the number of parts required for stock (the stockage objective). This is based on the number of parts used in 1 month. Units authorized a technical supply activity will not exceed a 15-day stockage level. As a general rule, shop stocks should not exceed 200 NSN items. Accurate records must be maintained by the shop supply element if the stockage objective is to be correct. Two forms control the degree of accuracy with which the stockage level is determined. The first of these has already been discussed--Document Register for Supply Actions, DA Form 2064. The other is the Record of Demands--Title Insert, DA Form 3318.

The document register will reveal the order and shipping time for repair parts. Assuming the Julian date of the request document number, (column a) is the order time, and the date completed (column i) is the culmination of the transaction, the difference between the two is the order and shipping time.

The record of demands--title insert is prepared for each item which is demand-supported and contained in the shop stock of repair parts. The title insert portion contains such information as nomenclature, unit of

issue, end item application, manual reference, and NSN. It also shows the stockage code, date the stockage objective was determined, and the stockage objective quantity. The reorder point quantity should be entered. Storage location of the repair part is entered as a code. Interchangeable or substitute NSN should also be noted, since the prime NSN requested may not always be issued.

The document number and quantity are entered on the record of demand portion of the form for each request. Quantity is expressed in units of issue. Demands are cumulative within a review period. Shop stocks must be reviewed at least every 6 months. Cumulative demands and quantity on hand are entered in pencil and the quantity on hand altered as parts are issued to repairmen. This issue of parts is not vouchered by the shop supply element. The "quantity demanded" is circled upon receipt of the parts.

## STOCK CONTROL SYSTEM

### OBJECTIVES

The Army field stock control system has the following specific objectives:

- It reduces the number of different items in the supply system.
- It reduces the quantity of items carried in stock.
- It reduces the variety of repair parts stocked and distributed.
- It speeds the movement of repair parts through the system, emphasizing those needed for NORS equipment.
- It standardizes stock control systems at the AVIM level.

## PRINCIPLES

The Army field stock control system is based on the following four principles:

- Selective stockage makes sure that only the fastest moving, most active items are stocked at the AVIM supply level, near the user. Slower moving supplies are kept in the rear. Items to be stocked are selected on the basis of the number of demands accommodation. Under the Army field stock control system, only the items in the authorized stockage list are allowed to be stocked. Those items must have met the demand criteria to be included in the list.
- Improved stock records insure that stock control and accounting functions are performed accurately. Stock records have been and are being improved to simplify and accelerate stock accounting functions. They consist of stock accounting cards, due-in cards, due-out cards, and demand data cards. They provide requisitioning information based on accurate replacement demands.
- Realistic demand or consumption data are used as the basis for stockage. One of the most important elements in the development of authorized stockage levels is quantity, type, and frequency of demands.
- Unit single-line requisitions are completely documented requests for stated quantities of single items of supply. These requests may be made on an 80-column punchcard, DA Form 2765, and only one line item may be requisitioned on a card.

## STOCK RECORDS

Stock records provide requisitioning information based on accurate demand data. The supply system depends on records of stock: on-hand, due-in, due-out, and issued.

## EDITING SECTION

All requests go to the editing section, where the supply action is begun. Here the customer comes in contact with his support unit. Courteous and efficient service is important. An editor should be selected for his knowledge of supply and also his maturity.

**General Responsibilities.** The editing section is the liaison between the supported and supporting units--between the requests and the supplier. It keeps the supply documentation moving through the appropriate channels, it edits the requests to be

sure they are complete, and it advises on substitutions for items not on hand. Up-to-date authorizations for stockage are kept in the section such as supply manuals, ASL's, unit prescribed load lists (PLL's), tables of organization and equipment (TOE), and tables of allowances (TA's). Moreover, the section edits the authorized stockage lists. It also checks the authority given on requests for issue.

***Numbers Assigned to Supply Documents.*** The editing section assigns two types of numbers to supply documents: voucher numbers and requisition numbers. Voucher numbers are assigned to inventories and adjustment reports. They are recorded in a voucher register, but they are not used for DA Form 2765 or for DD Form 1348. Requisition numbers are 14-digit numbers placed on all requisitions that go from the AVIM unit to the next higher level of supply--the DD Form 1348. These numbers are made up of the requisitioner's account number, the Julian date, and the serial number.

## STOCK RECORD SECTION

The stock record section is responsible for maintaining the supply accounting system and for determining the quantity and types of supplies required to fill the needs of the supported units. It prepares the forms which make up the stock record, showing by item the balance on hand and the receipt, issue, and disposal actions. It posts issues, receipts, and adjustments to the records. It corrects any errors. The stock record section computes operating levels, reorder point quantities, requisitioning objectives, and requirements. It also maintains demand history for nonstocked list items. When enough demands are recorded, the items may be added to the ASL's.

***Authorized Stockage List.*** Selective stockage criteria are established to insure stockage of the fastest moving or most active items at this supply level. The ASL is prepared by the stock record section and includes items that meet the established criteria for stockage. These are repair parts,

general supplies, common hardware, and special tools required by maintenance and supply units to perform field maintenance or to resupply supported units. Such items qualify for inclusion on the ASL when they have been demanded six times in 360 days. The ASL's are electronic accounting machine or automatic data processing machine punched cards, DA Form 2786, Stockage List Cards. Additions or deletions depend on demand date and additions or deletions to the supported stockage lists (PLL). Such actions are the responsibility of the accountable officer.

***Codes.*** Each item on the ASL is coded giving the reason for its inclusion. Combat-essential or mission-essential items must be in stock or on order. Nonstocked list items are those which do not qualify for stockage but are authorized for use as immediate replacement. The various codes and their meanings follow:

- Operational readiness float items.
- Mission-essential items.
- Concurrent support items for support of newly developed end items.
- Items qualified for stockage because of enough demands.
- Authorized mobilization reserve items.
- Standby support items.
- Training ammunition.

## POSTING TO THE STOCK ACCOUNTING RECORD

The term "posting" means entering facts on the accounting records. Two posting systems are authorized for maintaining stock records: preposting and postposting. In the more common system, preposting, all demands are entered on the stock record before the supplies are issued. The system of entering the issue of stock on the account after the stock has been released to the requestor is less used. Preposting takes processing time before issue of the item, delaying delivery, but it shows the actual

quantity on hand. Postposting provides faster service to the customer, but it cannot show the real quantity on hand. Choice of which system to use is up to the AVIM commander. The aim is to provide accurate and up-to-date stock records with the least number of personnel, while giving the fastest supply service to the supported units. Stock records must be current and accurate to show the true stock picture at all times. Postings are made in ink or by typewriter, and they are not allowed to be more than 2 working days behind the actual transactions. Priority designators are honored when the processing organization or activity requests them.

*Postings.* Entries in the stock records are either gains, losses, or adjustments. Postings in the gain column increase the balance on hand, and postings in the loss column decrease the balance on hand. Adjustment postings may be either gains or losses; they bring the balance in the record into agreement with the actual amount of stock.

*Posting Demand Data.* The quantities of recurring and nonrecurring demands shown on the request for issue forms (DA Form 2765) are recorded in the "Demand" column of the stock accounting record. Some actions are not posted in this column such as issues or shipments to other property accounts, returns of excess, inventory adjustments, due-out releases, and transfers of serviceable stock to the unserviceable record. The following subparagraphs tell you more about recurring and nonrecurring demands.

- Recurring (R) or replacement demands are for replacement of items consumed or made unserviceable in use--expendable items. Such demands also include replacement of parts or components of an assembly. Losses resulting from abandonment, destruction, enemy action, and pilferage are also posted in the "recurring" column.
- Nonrecurring (N) or one-time demands are requests for initial issue of supplies to new inductees or to newly activated units. The first issue of newly standardized items, issue resulting from in-

creased allowances, and items approved for issue for the first time in excess of the quantity authorized in approved tables are all posted as nonrecurring demands in the initial column of the record.

*Processing and Posting Request Documents.* When the stock record clerk receives requests for issue (DA Form 2765) from the editing section, he checks to see if wanted stocks are available. If enough stock is on hand, the stock record clerk posts the issue to the stock accounting record recording the date, the organization document number, the organization, whether the demand is recurring or nonrecurring, and the "loss" quantity. Then, on the request for issue form, he enters the quantity to be issued, its financial inventory accounting number, unit price, total price, his initials, and the date of the posting.

*Processing and Posting Request Documents Involving Due-Out.* If the balance on hand is not enough to fill a request, it is dropped from the stock accounting record and a due-out is established for the rest. The stock record clerk enters the date, organization document number, and organization. He also posts the total quantity requested under the proper demand column. Even though the total quantity is not presently on hand the demand is posted for the total quantity. The priority designator is posted next to the quantity demanded. Demands are the basis for requisitioning objectives. Therefore, the total demand quantity must be entered.

*Processing and Posting Turn-In Receipt Documents.* Receipts resulting from turn-ins or from requisitioning actions are posted as gains to the stock accounting record. The date, organization document or requisition number, and organization from which the items were received are posted in the appropriate columns. Quantity received is posted in the gain column, and the balance-on-hand column is increased accordingly.

*Correction Procedures.* Erasures or changes in figures are not allowed on stock accounting records. Therefore, specific methods of making corrections are prescribed. If a wrong entry is discovered before any



other entries are made, the incorrect entry is lined out and the correct posting made on the next line. If a gain or loss posting is made in the wrong column but the balance is correct, the wrong entry is lined out and the right one made in the proper column. If a correction requires a change in the balance column, the abbreviation "corr" is entered in a blank space on the same line as the error. Then the correcting entry, using the original voucher number and date, is made on the next open line. The correcting entry is the amount of the increase or decrease by which the balance column is affected, posted to the gain or loss column. The abbreviation "corr" is posted on any open space on the line of the correction. If a voucher number is posted incorrectly, the wrong number is lined out and the correct one entered above it. For additional information on correction procedures, see AR 710-2.

## REQUISITIONING OBJECTIVES

Requisitioning objectives are the maximum quantities of material authorized to be on hand and on order to sustain operations. They assure adequate supplies to meet recurring demands on AVIM unit stocks. Accountable officers adjust demand-supported requisitioning objectives when specific planning information reflects forecast changes in mission assignments, troop strengths, equipment densities, and other support requirements.

**Days of Supply.** The requisitioning objective is the sum of the operating level in days, the safety level in days, and the order and shipping time in days. The sum may be expressed in either days of supply or in quantities. Days of supply are found first. The normal control period for item stockage and computation of requisitioning objectives is 360 days, and the normal criteria for inclusion in an ASL is for the item to be demanded six or more times in 360 days. Do not confuse the control period of 360 days at this level with the 180-day control period used at organizational level.

- The stockage objective of AVIM units of a field army normally will be authorized 30-day supply (15-day operating level

plus 15-day safety level) of those items authorized for stockage. AVIM support of a field army may be authorized a stockage objective not to exceed a 45-day supply (30-day operating level plus 15-day safety level).

- The safety level is normally 15 days of supply. It provides a cushion or a safety level for use if demands are increased or the normal flow of replenishment requisitions is interrupted.
- The order and shipping time (OST) is the interval between the time the requisition is submitted and the time the goods or supplies are received. The OST is determined by the unit commander from past experience. It is stated in days; the number of days is rounded off to the next higher multiple of 5, to make computation easier.

## WAREHOUSING

Warehousing is storing, but it also involves locating stock, receiving and classifying it, and issuing it. An AVIM company stocks aircraft parts and related supply items for equipment it repairs. It also stocks repair parts for issue to the unit it supports. While storing and repairing, the company must still be approximately 50 percent mobile. The variety and quantity of items stocked must be kept as low as possible, yet stockage should be extensive enough to provide needed support without having to wait for repair parts.

**Locator.** A file is maintained which shows the exact location of all parts stored in the company. It is called the locator file, and it is the foundation of all successful warehousing. It may be a visible book file, or it may be a 3 x 5 file card box. The minimum information on an item in the file must include the NSN or part number, nomenclature of the item, unit of issue, and the item's location. All items are filed by national item identification number. For parts stored in trucks, the file also gives the truck number, the cabinet number, and the drawer number. Some items are large, bulky, or irregular in shape. These could be stored in a bulk storage location, perhaps a stake trailer if the item could be kept in open storage. Location surveys should be conducted as often as necessary, depending on

the effectiveness of the system. Often such a survey reveals empty locations, a waste of valuable space. If an item is not to be found where the locator file says it is, it must be hunted out. Meanwhile, a warehouse refusal is given to the requestor, pending resupply or relocation, indicating that either the item is not on hand or there is not enough of it to fill the request.

**Receiving and Classification.** All incoming shipments must be checked with the documents that accompany them to be sure the quantities are the same and that stock numbers match. The condition of the package or container is noted, and a receipt is signed for the shipment. Documents are forwarded to the editor, and any discrepancies in the shipment are noted and recorded. Any shipment showing damage should not be opened until the supply officer is present to witness the extent of damage. Shipments containing multiple-line items should be unpacked, sorted, and turned over to storage. For single-line items, unpacking and uncrating should be only enough to be sure of the count and condition. Items needing inspection and classification are checked only by technical inspectors from company headquarters. If there is any question as to the serviceability of the item, it should be classified "unserviceable." All aircraft repair parts must be properly tagged at all times showing serviceability status. All items received from supported units must be tagged also. Any questionable items, such as those with damage that may be due to other than fair wear and tear, should be brought to the attention of the supply officer immediately.

**Storage.** All items of supply must be stored in their proper location according to the locator file. Large or heavy items should be placed where they may be inspected without having to be moved. If assemblies have historical records that must be kept with them, those records must be protected from the weather. Some items, such as gaskets, have dates beyond which they should not be issued, and this too must be taken into account in storage. Some items must be handled and stored with special care, such as rotor blades.

**Issue.** The quantity to be issued is always stated on the source document the DA Form 2765 when the request is from AVUM level to AVIM company. All agents authorized to receive supplies have signature cards on file in the storage and issue section. Identification is required of all personnel who come to receive supplies by matching their signatures against those on the cards on file. Emergency issue may be made without the necessary accompanying paperwork when the editor or other authorized member of the supply section approves such action. Then an informal record of the issue is made and held until formal documentation has been processed covering the issue.

## INVENTORIES

Through continuous issue and receipt of supplies, the stock accounting record and the actual count sometime disagree. Then an inventory of stock on hand is necessary, and the physical inventory must be reconciled with the recorded balance. Inventories are taken to obtain an accurate count of the items in stock and to check their condition, also to reconcile stock record balances with actual on-hand quantity in storage. Inventories also provide the supply officer with information he needs for evaluating stock record balances at least once a year.

**Types.** Three types of inventories may be conducted by AVIM companies: complete, cyclic, and special. The supply officer decides which is to be used.

- Complete. The AVIM unit closes down and all stocks are inventoried at once. This type is not suitable for field use because it takes away all support from the units during the entire inventory.
- Cyclic. An inventory of a portion of the supplies at one time is called a cyclic inventory, a continuous counting, usually one or more Federal supply groups or classes at one time. Each item in stock is inventoried at least once a year. This method allows operations to continue, closing down only the groups or classes under inventory. However, requests with priority designators of one through eight may be processed for items under

inventory. All supported units are notified of the inventory status at all times.

- **Special.** Inventories are conducted at special times when selected items must be counted for warehouse refusals or credit balances, or when location surveys show unrecorded balances or no recorded locations for recorded balances. The company commander or the supply officer can direct that a special inventory be made whenever he feels it is necessary.

**Preinventory Procedures.** Certain actions must be taken by the storage unit to prepare stocks and storage areas for physical count. All stock records, receipts, and issues must be current. Location surveys are made to get the locator file up to date. Any items are relocated that need it. All items in storage are identified. The company's supported activities are notified of the inventory schedule and of the restriction of issue to priorities one through eight. Any property not to be counted is marked "Do Not Inventory." Inventory count cards are printed with the card ticket number, stock number, item description, inventory adjustment voucher number, unit of issue, unit price, and location. All issue documents are stamped or marked "before inventory," or "after inventory" for items issued after inventory has begun.

**Inventory Method.** An inventory team is made up of a counter and a recorder. The count is entered on each card, which is signed and dated by both the counter and the recorder. Count cards for which no stock location can be found are so marked, and the inventory quantity is recorded as zero. Completed count cards are returned to the supply officer. Then the difference between the inventory and the stock record balance are reconciled, if possible.

The supply officer may accept the count card balance as correct if the overage or shortage is not worth over \$10. Then the new balance is posted on the stock accounting record, using the inventory adjustment voucher number assigned to the count card. The item is not included on the inventory adjustment report.

When the value of the overage or shortage is over \$10, a recount is made. When it agrees with the recorded balance of the original count, or when two recounts agree, the work is finished, and any difference between the final count and the recorded balance is included in the Inventory Adjustment Report, DA Form 444.

**Inventory Adjustment Report.** Inventory discrepancies are reported on DA Form 444, showing overages and shortages, recorded balances, and dollar adjustment necessary. Any losses which cannot be attributed to normal operations are placed on a Report of Survey, DD Form 200. The installation commander or his representative approves inventory adjustment reports, never the supply or accountable officer. Any items not approved are placed on a report of survey. Entries on the inventory count card are ticket number, item nomenclature, unit of measure, recorded quantity, adjustment, unit price, and adjustment dollar value.

## MILITARY STANDARD REQUISITIONING AND ISSUE PROCEDURES (MILSTRIP)

### INSTRUCTIONS

MILSTRIP is an Army regulation containing Department of the Army instructions for one system of requisitioning, issuing, receiving, and managing material inventories (AR 725-50). The regulation applies to Army activities at AVIM level and above. MILSTRIP provides uniform procedures for all requisitioners and all suppliers. It is designed to meet the essential requirements of all military services and it provides for interservice supply support operations.

### MILSTRIP REQUISITIONS

Requisitions are prepared by the supply element of the organization, which is in the supply platoon. Requirements are determined by the stock records section. Requisitions are prepared on forms to be used with an electronic accounting machine. All characters are prepunched for electronic transmission. Continental United States (CONUS) and oversea theaters have a network of transceivers connecting each

support activity to the next higher level of supply and to its supported units, if applicable. Three basic forms are used in MILSTRIP: DD Form 1348, DD Form 1348m, and DD Form 1348-1. Each of these forms has many uses when properly coded. The 1348 and the 1348m are used for requisitions, and the 1348-1 is used for release of material. They all have various data on them: information on transmission and the item itself, the document number and address, and supplemental data including the priority code and project code. The following paragraph gives information about the forms, and the next paragraph tells of their uses.

*DD Form 1348*, DOD Single-Line Item Requisition Document (Manual), is used by requisitioners who do not have punchcard machines. Entries on the form are typed or legibly printed. The 1348 is electronic-accounting-machine size and can be used in the machine at the supply source. Consisting of four copies, the original goes to the supply source and the rest are retained by the requisitioner to be used for internal processing and control.

*DOD Form 1348m*, DOD Single-Line Item Requisition System Document (Mechanical), is used by requisitioners who have automatic data processing punchcard machines. The mechanical form has the same data printed on it as the manual one and is designed for mechanical application and punchcard data transmission. Requisitioners who use this form may use copies for internal processing and control.

*DD Form 1348-1*, DOD Single-Line Item Release/Receipt Document, is used by the supplier to document a shipment to a requisitioner; it is used by the requisitioner as a receipt document. The form has seven copies: three go to the requisitioner with the materiel, one goes to the requisitioner with the advance copy of the bill of lading, one is attached to the outside of the shipping container, one is retained by the transportation distribution point, and one is retained by the supplier.

#### USES OF FORMS

When properly coded, the 1348's are used for many purposes. The DD Form 1348 (manual) is used for requisition, followup,

cancellation, and notice of availability. In addition to these four, the DD Form 1348 (mechanical) is used for many more purposes. It can be used for supply status, reply to followup, reconciliation request, shipment status card, passing order, referral order, supply directive, redistribution order, material release order, material release confirmation or denial, and response to reconciliation request for due-out. The DD Form 1348-1, when coded to do so, can be a release document from the shipping activity to the requisitioner resulting from a requisition, a release document for retrograde material, a release document for interbase movement, or a receipt document by the requisitioner.

#### MATERIAL PRIORITY SYSTEM

At the AVIM company, issue priority designators are entered on the DA Form 2765's that come from the supported units. These are noted, and the AVIM company abides by them in its issue of supplies. When the AVIM company requisitions from its source of supply, it, too, puts the priority designator on its DD Form 1348 or 1348m. Supply personnel at all levels honor the system.

#### STOCKAGE POLICIES

Selection of items to be stocked at all echelons of supply will be directed toward assuring the attainment of operational readiness of supported units and will be based on frequency of demand and/or item essentiality. The primary source of supply for items not stocked in the supply system and low mortality items will be through fabrication, local procurement, and controlled cannibalization. A single quantitative level will be maintained for an item of supply authorized for stockage. Within this level, individual levels may be identified and maintained for obligated stocks; for example, operational development projects, special and in-place reserves. Economic inventory principles (EIP) will be used to the maximum to reduce administrative workload and the cost and frequency of requisitioning. Stockage lists will be maintained at each supply echelon. Stockage lists at each echelon will include items to support stockage lists of all subordinate supported echelons. Stockage at each

supply echelon will be maintained at a minimum consistent with the assigned mission and will include all items authorized for stockage at each supported echelon.

### **STOCKAGE POLICIES FOR AVIM**

Stock on hand at all AVIM units responsible for issuing supplies to supported units, organizations, and field maintenance activities will be kept to a minimum consistent with the assigned mission. Stockage will not include supplies for which there are no anticipated requirements, except as provided below. AVIM will not stock repair parts which cannot be used within the authorized scope of maintenance supported organizations and activities.

AVIM ASL's will consist of the following:

- Demand supported items except as specified by appropriate DA supply publications.
- Limited quantities of items authorized for stockage in appropriate -30P, -35P, -40P to insure continued operation of supported equipment.
- Operational readiness float items when specifically authorized.
- Initial stockage of parts for newly supported items.
- Items contained on the direct exchange list.
- Items contained on the maintenance shop stocklist.

### **RETENTION OF STOCKS BY AVIM**

Based on the prescribed number of days of supply, requisitioning objectives will be established quantitatively for all items for which there are sufficient replacement demands. Past replacement demands, as related to item density supported during the control period or for a comparable period in case of items of seasonal issue, will be used as a basis for determining average consumption. Stocks on hand equal to the sum of requisitioning objective plus an additional quantity for 90 days expected usage are authorized for retention. Quantities over this authorized retention level will be processed as excess if the line item value of such excess is

greater than \$10.00 for CONUS and \$25.00 for overseas. Stocks may be retained in accordance with above criteria and reduced through attrition. This is not to be interpreted as authority to requisition quantities above the requisitioning objective; such excess should be retained and reduced through attrition.

### **MAINTENANCE SHOP STOCK**

Commanders may authorize maintenance activities a limited stock of expendable supplies and the repair parts required to assure expeditious accomplishment of the assigned maintenance mission. These stocks will not be used as a source of supply of turn-in for units. Selection of items for maintenance shop stock will be based on three demands in 180 days or anticipated requirements for programed repair.

Items coded A, D, and FHLO in the DA-20P through -35P manuals and items on the direct exchange list are not authorized to be included in shop stocks.

Quantities of items kept in shop stock will not exceed a 30-day stockage objective for maintenance shops not having a supply support mission and a 15-day stockage objective for direct support (DS) or general support (GS) having an assigned supply support mission.

Maintenance associated supplies (commonly referred to as bench stock or shop supplies) consist of common hardware, bulk supplies (electrical wire, tubing, rope, webbing, thread), welding rods, sandpaper, and similar items. These supplies may be placed in bins on the shop floor adjacent to workbenches and bays for immediate availability to the maintenance activity in unit quantities which are in excess. They are authorized to be retained and reduced through attrition.

The authorized stockage objective and the reorder point for other than bench stock will be determined from a conversion table contained in appropriate regulations. Packaging or color coding the minimum inventory reorder levels is an effective means of insuring that shop and bench stocks are not depleted without reordering.

Adequate controls and informal records will be maintained by the maintenance activity to assure proper management and use of items stocked. Machine accounting procedures may be used where the capability exists.

Consumable items such as rivets and individual parts which are subject to failure at an unpredictable rate (that is, not subject to normal demand rates) and which are nominal in cost may be issued to shop stock.

These items may be retained indefinitely regardless of demand or issue history and will be replenished immediately upon consumption.

Stock record cards of the supply activity will be annotated at time of issue with the words "shop stock" and the date. Only shop stock records need be maintained by the maintenance activity.

## STOCK RECORD SUPPORT

Activities designed to perform stock record support of the Army field stock control system will provide as a minimum the following service to supported supply activities.

- Maintain current electrical accounting machine (EAM) card files or automatic data processing system (ADPS) magnetic tapes of items authorized each supply activity.
- Furnish card files and/or machine listings of currently authorized stockage items on a semiannual basis for reconciliation purposes. When requested by the supported activity reconciliation may be made more frequently; however, no oftener than quarterly.
- Process catalog data and Army Master Data File (AMDF) changes monthly and assure that all stockage lists of supported activities reflect current catalog data.
- Provide submitting activities information as to acceptance or rejection of stockage list additions and acknowledgment not later than 30 days after receipt. Title inserts (DA Form 1297) and machine listings for additions and

changes will be provided when requested by the major subordinate commander to all activities not fully mechanized.

- Oversea AVIM units designated as requiring stock record support will process all requests for additions and deletions to stockage lists through the supporting supply activity to the appropriate stock record support activity.

## SUMMARY

Here are a few key points you should remember about repair parts supply:

- Proper maintenance increases equipment usefulness and reduces supply requirements for equipment replacement.
- Direct exchange (DX) is a supply system at the AVIM level.
- Parts should be fabricated when they cannot be obtained through supply channels.
- Controlled cannibalization may be performed in accordance with the provisions of AR 750-1.
- AVIM units help a supported unit to plan and manage repair parts stockage through technical assistance, review of PLL, and stocking mission essential items when such items are demand supported.
- Shop supply is the liaison between a repairer and a technical supply activity.
- The Army field stock control system is based on four principles: selective stockage, improved stock records, realistic demands or usage data, and unit single-line requisitions.
- MILSTRIP requisitions are prepared in the supply platoon.

While repair parts supply represents an important element of AVIM operations, so do unusual environments under which AVIM may be performed. That subject is covered in the next chapter.



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## CHAPTER 7

**MAINTENANCE IN UNUSUAL  
ENVIRONMENTS**

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Maintenance procedures employed in one environment normally are not appropriate for another. Precautions applied to a desert area do not necessarily apply in a tropical region and if applied could cause damage to the aircraft or component. This chapter discusses procedures and precautions that must be employed when performing maintenance in unusual environments. Specifically, it covers--

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## DESERT OPERATIONS

Desert operations present many maintenance problems because of sand and heat, long lines of communication, poor roads, and difficulty in locating supported and supporting units. Because of these factors, air transportation can be used to great advantage for movement of contact teams for onsite maintenance and delivery of repair parts.

In desert operations, certain maintenance requirements increase significantly over those encountered in other types of operations. Preventive maintenance is vital. More frequent inspections and scheduled maintenance are required. For example, it becomes necessary to clean air filters more frequently, to check cooling systems more often, to decrease intervals between lubrications and oil changes, to clean weapons repeatedly, and to take all possible measures to avoid sand contamination of equipment. For example, fire control instruments should not be disassembled in the open.

At the aviation intermediate maintenance (AVIM) level, operations are influenced as follows:

- Distance to supported units will be increased, and supported units may be more difficult to locate when onsite maintenance or recovery is required.
- Passive air defense measures, such as the use of camouflage nets to hide vehicles and facilities, require extensive effort. Dispersion, as a protective measure, is also required.
- Stockage levels of certain repair parts may have to be increased; for example, filters, bearings, cooling system components.
- Maintenance personnel lose productivity during the heat of the day, and as much maintenance as possible should be done at night. Operations at night may require maintenance to be performed under blackout conditions.

- Aviation unit maintenance (AVUM) requirements for assistance to supported units may increase. This would require an increase in the amount of work evacuated to depot maintenance as AVIM maintenance overload.
- To the extent possible, all maintenance should be performed within a shelter of some kind to prevent entry of sand into the external working parts of materiel that has been exposed during maintenance operations. Even when performing maintenance onsite, a shelter or barrier of canvas can be constructed to provide some protection from blowing sand.
- Because of increased mobility requirements of supported units, more emphasis on contact team support may be required.
- Increased workloads at the AVIM level may require an increase in the number of AVIM support units to reduce the workload being evacuated to depot maintenance units as AVIM overflow.
- Communications with supported units may become a problem because of distance factors.

Defense of units against air and long-range missile attack will require greater dispersion between elements of the unit and will therefore result in less efficiency in production.

At depot level, maintenance workloads may increase because of increased evacuation from AVIM maintenance units.

For details on operations in the desert, see FM 90-3.

## JUNGLE OPERATIONS

In jungle operations, heat and moisture directly affect equipment, requiring strict adherence to preventive maintenance practices and more frequent scheduled maintenance. Rough terrain and poor roads also adversely affect vehicular equipment and may necessitate more maintenance at all levels. Increased maintenance requirements,

coupled with transportation difficulties, may require units to carry increased loads of repair parts.

Absence of adequate trails, roads, and waterways; density of natural growth; the season; security of routes; and general terrain have a significant influence on the type of transportation that can be used and, consequently, on the functioning of the maintenance support system. At the AVIM level, onsite maintenance will be practiced to the degree practicable, with air delivery of contact teams being used where practicable and possible. Aircraft may be required for delivery of repair parts, transport of onsite maintenance (contact) teams, and evacuation of materiel.

When support is being provided to units that are widely dispersed, AVIM units may be required to augment the organizational maintenance capability of supported units. Such assistance may be in the form of AVIM repairmen assisting organizational maintenance personnel. Such personnel may also perform less time-consuming AVIM repairs at using unit locations. At the AVIM level, maintenance units may be required to perform more extensive maintenance than in normal operations because of difficulties in evacuating materiel for backup and overflow maintenance.

Because terrain restricts the number of good sites available for maintenance operations, considerable engineer effort may be required to prepare suitable locations. Therefore, maintenance units may not be able to deploy as often as they would in more favorable terrain. In areas where monsoon rains are experienced, careful consideration must be given to site selection. These limitations may force maintenance units to locate with other types of units, forming a concentration of support type units in one area. This simplifies the problems of security of such areas from ground attack and may well be necessary in areas of large-scale guerrilla activity. Such concentrations, however, provide good targets for air attack and require provisions for air defense.

For details on jungle operations see FM 31-35.

## MOUNTAIN OPERATIONS

Maintenance support in mountain operations is very difficult. The elevation itself hampers operating efficiency of personnel and equipment. The rugged terrain limits availability of roads and suitable areas for support operations. Weather also influences the performance of troops and equipment.

For operations in such areas, it is necessary to train personnel to adapt to high altitudes. Equipment may have to be adjusted to permit efficient operations at higher elevations. Changes in equipment and organization of combat and support troops are often necessary, with specific decisions in these areas depending on the specific area involved and the season. From the standpoint of maintenance support, operations will be influenced as follows:

- It may be necessary to use rotary wing aircraft for delivery of repair parts, movement of contact teams for performance of onsite repair, and evacuation of unserviceable items.
- Technical assistance or onsite maintenance will be emphasized to reduce evacuation requirements. AVIM units may attach small teams of personnel to the AVUM elements of supported units to perform AVIM and to assist in unit maintenance.
- Because of the limited road net, it may be necessary to use mobile repair teams to patrol the roads and repair vehicles. When such vehicles cannot be repaired promptly, they must be evacuated speedily to avoid blocking roads.
- Although the number of vehicles requiring support may be reduced, maintenance requirements for those remaining will be increased. For example, operation of vehicles in mountainous areas will result in increased requirements for maintenance of brake, suspension, and transmission systems. Thus, repair parts stockage for such repairs may have to be increased.

- While AVIM units will locate as close as practical to the units they support, the limited availability and the requirements of terrain suitable for logistical support and the requirements of various types of support units for such areas may well dictate where maintenance and other support units establish their operations. Because of the criticality of maintenance support in mountain operations, the commander making area assignments must give maintenance units a high priority for areas required. The maintenance unit commander must make known his requirements in terms of firm and fairly level terrain and acreage.

For additional details on mountain operations, see FM 31-72.

## COLD WEATHER OPERATIONS

Terrain and climate of northern regions (and other areas where similar terrain and climate are experienced) complicate military operations. Operations in snow and extreme cold require special training and acclimation of personnel and the use of special equipment and operational techniques.

Trafficability is one of the biggest problems in northern operations, especially during the spring breakup and during the summer when the ground thaws and ice in streams and lakes melts. Since there are few roads in such regions, track-laying vehicles of the low ground pressure type provide the only means of cross-country mobility in certain situations. All ground movement is hampered by mud, muskeg, swamp, marsh, and open water in the spring and summer seasons, and thorough ground reconnaissance is required for overland movement. In winter, extreme cold affects the snow, improving trafficability, although tracked vehicles and sleds may be required for movement. Weather may limit the use of aircraft.

Northern operations are characterized by the requirement for a considerable amount of specialized equipment such as tracked vehicles, sleds, and heated shelters. Every item of equipment used in northern operations is affected by extreme cold and

snow in winter, and mud and water in summer. Thus, the extensive amount of equipment needed and the wear and tear on equipment increase maintenance requirements and problems. Other factors affecting maintenance support operations are as follows:

- Heated shop facilities are essential to maintenance support operations.
- Evacuation of unserviceable items from using units to support maintenance is made more difficult because of the terrain.
- Onsite maintenance is difficult because of extreme climatic conditions which hamper operations and curtail personnel effectiveness.
- Repair parts requirements will be larger than normal, in terms of quantity and variety.
- Maintenance performed onsite in extreme cold weather will take more time and effort than under temperate conditions, as will the recovery and evacuation of disabled equipment.

For more information on operations in northern regions, see FM 31-70 and FM 31-71.

## SUMMARY

Some important thoughts about maintenance in unusual environments are listed below:

- In jungle and desert operations, preventive maintenance is vital because more frequent inspections are required.
- Maintenance support in mountain operations may require use of rotary wing aircraft for delivery of parts, movement of contact teams, and evacuation of unserviceable items.
- Northern (cold weather) operations require specialized equipment such as tracked vehicles, sleds, and heater shelters.
- Heater shops are essential to maintenance support in extreme cold.

Aviation logistical assistance is the heart of any AVIM operation, so let's find out about that kind of help in the next chapter.



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## CHAPTER 8

## AVIATION LOGISTIC ASSISTANCE

Efficient maintenance is necessary for aircraft to operate. In the same manner, technical assistance supports maintenance. The logistic assistance program is a source of help to those with maintenance problems. Unusual or complex maintenance may be a problem, or a new aircraft may be allocated requiring maintenance skills not present in the supported or supporting unit, or modifications may be ordered which are beyond the knowledge of those supporting the aircraft. Whatever the reason for the requirement, logistic assistance may be called upon for help.

According to AR 700-4, the objective of the program is to provide assistance to commanders in resolving those maintenance and supply problems incident to the materiel readiness status of their commands. Logistic assistance is requested when problems are beyond the capabilities of the commander to resolve with his own resources and his aviation intermediate maintenance (AVIM) support.

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## LOGISTIC ASSISTANCE

Logistic assistance is the advice, assistance, and training provided by recognized maintenance personnel. These may be military or civilian employees of the Army or employees of industrial or commercial companies serving the Army under contract. Because men and complex equipment must be introduced into the Army system as rapidly as possible and because military personnel are constantly changing, maintenance activities often need help or instruction to keep their capabilities up to their requirements. The logistic assistance program provides solutions to maintenance/supply problems arising in the field. It is a pool of knowledge and skill from which all levels may draw for aid in operating or maintaining their equipment.

Commanders at each level are responsible for establishing a self-sustaining supply and maintenance capability to the extent of available resources. The logistic assistance program is not intended as a permanent augmentation of the commander's staff; instead, it is limited to the amount of time necessary to solve specific problems and train assigned personnel.

The Department of the Army provides as much of its own logistic assistance as possible, primarily through civilian field maintenance and supply specialists employed by or controlled through contracts by major subordinate commands of the US Army Materiel Development and Readiness Command (DARCOM). They are mobile and can be assigned from one area to another. Logistic assistance personnel coordinate actions with the activity commander keeping him fully informed as to findings and recommendations. Some of the functions they perform are to--

- Help maintenance units by performing on-the-job (OJT) work to show how it is done. In such assistance they may be logisticians, maintenance managers, engineers, equipment specialists, training instructors, production supervisors, or representatives of equipment manufacturers.

- Advise both technical and nontechnical personnel. Besides answering how-to-do-it questions, they recommend test equipment, publications, and repair parts and tools. Moreover, they know where to get them.
- Visit users of aircraft equipment to aid in solving problems of installation, operation, and maintenance.
- Assist unit and activity commanders in finding deficiencies in maintenance capabilities. They recommend improvements and help to carry them out.
- Instruct organizations in preparing equipment for field exercises, maneuvers, special operations, and oversea movement to be sure that the item is complete and serviceable, and that its repair parts and publications are present and current.
- Act as members of new equipment training (NET) teams, mobile training teams, and maintenance assistance teams.
- Provide assistance on in-storage maintenance and on the care and preservation of stored materiel.

## TROOP SUPPORT AND AVIATION MATERIEL READINESS COMMAND (TSARCOM)

One of the major subordinate commands under DARCOM, TSARCOM, provides logistic assistance for all TSARCOM equipment including aviation and troop support systems. Ordinarily, requests for logistic assistance go through maintenance channels under provisions of AR 700-4. When requests are received by TSARCOM, they are processed by the field service activity (FSA).

The FSA provides logistic assistance to the user-commanders on a worldwide basis. Units in continental United States (CONUS) and outside continental United States (OCONUS) are visited periodically in accordance with priorities established by the user-commanders, DARCOM log assistance officers (LAO's) and FSA branch chiefs.



While duty-stationed at the user-commands, logistic assistance personnel remain under the operational control of TSARCOM FSA.

Logistic assistance personnel are divided into two categories--field maintenance technicians (FMT's) and field supply technicians (FST's). These FMT's and FST's may be supplemented by contract technicians.

## **FIELD MAINTENANCE TECHNICIANS**

The Army employs both military and civilian personnel as FMT's. They are technically qualified to provide assistance, including instruction, in the installation, operation, and maintenance of equipment. Several different types of specialists are included in this category: FMT's, NET teams, and mobile training teams.

## **FIELD SUPPLY TECHNICIANS**

FST's are supply oriented technicians who provide assistance to user-commanders on the retail supply system. They also provide field interface with the national inventory control point (NICP).

## **CONTRACT TECHNICAL SERVICES PERSONNEL**

Employees of industrial or commercial firms who work for the Army under nonpersonal contracts are called contract technical services personnel. These agreements are between the Army--in aviation--and the firms which employ the personnel rather than between the Army and the individuals. Contract technical services personnel provide advice, instruction, and training in installing, operating, and maintaining equipment. At the manufacturer's plants and facilities or at an Army location, engineers and technicians teach Army personnel the skills necessary to install, operate, and maintain their company's products. The three types of contract technical services personnel are described as follows:

- **Manufacturer's Representative.** An employee of an industrial or commercial firm who is specially trained, qualified,

and experienced in installation, operation, and maintenance of the equipment manufactured by his company is the manufacturer's representative. He is known as the "tech rep" to those who work with Army aircraft. His services are normally obtained when the equipment is ordered so that he may help the military user with installation, maintenance, and training requirements of his company's products. The manufacturer's representative can only stay with the unit for 1 year after the equipment enters the inventory unless a waiver is requested from DARCOM or replaced by an Army logistic technician.

- **Contract Field Technician.** Employed by a manufacturing, engineering, or consulting commercial or industrial organization, the contract field technician works for the Government on a nonpersonal service contract. He provides maintenance service as an advisor on installation, operation, and maintenance of equipment. This equipment is not necessarily the product of any one manufacturer. For example, he could advise on the maintenance and operation of all aircraft engines and related parts being used by the Army.
- **Contract Technical Instructor.** Preparing and providing classroom and shop instruction for installation, operation, or maintenance of equipment used or supported by the Army is the duty of the contract technical instructor. He is an employee of a manufacturing, engineering, or consulting commercial or industrial organization.

## **ARMY AIRCRAFT MOBILE TRAINING TEAM**

A part of the logistic assistance program, an Army aircraft mobile training team is made up of either logistic specialists or contract technical services personnel trained in the support of a particular aircraft and

ready to instruct on its maintenance. The TSARCOM controls mobile training teams at all times-telling them what and where their jobs are and how long they will last.

The teams assist commanders in improving the proficiency of maintenance personnel at aviation unit maintenance (AVUM) and AVIM levels. This they do by providing technical information on maintenance, orientation, familiarization, and modernization, and by giving training instruction on a particular aircraft or system. The program is about half classroom and half practical work. It may, under some circumstances, also include pilot checkout and proficiency training. Each team has three curriculums. Curriculum I deals with the AVUM level; curriculum II includes AVIM support maintenance and the portions of AVUM usually dealt with at AVIM level; curriculum III includes AVIM and depot support maintenance and AVUM that the mechanic at the higher level may do.

When the team has finished a job, it prepares a detailed report which is forwarded to TSARCOM.

#### FIELD SERVICE REPRESENTATIVE

A field service representative is an employee of a manufacturing or commercial firm that makes military equipment or components. He serves as a technical communications channel between the producer and the user. He also provides an advisory service, including transmitting knowledge necessary to update skills for operating and maintaining the producer's equipment and for resolving technical problems incident to it. Field service representatives, when accredited by the units using their services, are afforded the same privileges and support as contract field services personnel.

Field logistic representatives are not ordinarily used longer than 12 months after the introduction of new equipment into a major command. Authority to process contract field services procurement requests is restricted to TSARCOM. Personnel performing services under these contracts are under control of their companies; they may not be used for certain jobs which are listed in AR 700-4.

#### REQUESTING LOGISTIC ASSISTANCE

Before requesting logistic assistance, commanders use their own capabilities. They provide for attainment of logistic assistance objectives, furnish support for the program, and orient personnel.

A request for supply or maintenance logistic assistance is submitted through command channels to the major commander, who determines whether the requirement can be met from resources within his command. If assistance is required, he makes the request by contacting the appropriate source listed in AR 700-4. Since the sources are numerous, and the appropriate one is determined by the identity of the requesting unit and the kind of assistance needed, they are not given in this chapter. Emergency requests may be submitted by the most expeditious means in any form.

A logistic assistance request should include the name and location of the requesting unit and of the unit to which personnel should report. It gives the nature of the problem, the specific item or component with which assistance is needed, density of the item, and month and year it was introduced into the command. The request also states the number of personnel needed; how long assistance is required; unusual physical demands; and requirements for special tools, equipment, uniforms, and security clearance. Daily work schedule and overtime estimated for assistance personnel, availability and cost of logistic facilities and privileges, and a description of the plan and schedule to develop in-house capability are included in the request information. In overseas requests, theater clearance and unusual climatic conditions or community customs are mentioned.

#### INFORMAL LOGISTIC ASSISTANCE

Aviation maintenance unit commanders must be aware of the formal logistic assistance program but should never rely on it as a substitute for their own program tailored to their own requirements. This program should provide for frequent visits to supported units by logistic assistance teams. Such visits should be made as often as the

situation permits and should be designed to determine problems of supported units and any necessary remedial action. Information derived from such visits should be carefully analyzed to determine the ways and means by which AVIM support to units can be made more effective. The visited unit should be encouraged to request logistic assistance whenever it is unable to cope with a problem because of a lack of personnel, equipment, or facilities; inadequate training of personnel; or lack of familiarity with equipment or procedures. The operating efficiency of the supported unit will thereby be increased and the demands on supporting maintenance lessened. Logistic assistance, however, is not limited to assistance provided at the request of the supported unit; it should be offered to the unit whenever any information available to the supporting unit indicates AVUM deficiencies. This information may develop from results of inspections or from work performed on supported unit's equipment in the maintenance shop.

## COMMAND VISITS

Upon being assigned a support mission, the maintenance unit must establish initial contact with the supported unit. The initial contact should be made by the maintenance unit commander, accompanied by one or more of his key personnel. The supported unit should be provided routine information such as location of the supporting unit, services to be provided, and procedures for obtaining these services. Conversely, the maintenance unit commander should obtain information pertaining to the supported unit such as equipment densities and status and repair parts supply status. Maintenance and repair parts problems and requirements should be discussed. After this initial contact, the maintenance unit commander should schedule additional visits to supported units to maintain good working relationships.

## LIAISON PARTY

The liaison party is the normal method of contact between maintenance companies and units they support. As a minimum, this party should consist of an officer, a warrant officer

or noncommissioned officer who is thoroughly familiar with maintenance procedures and requirements, and qualified supply specialists. AVIM liaison parties will visit supported units as directed. These visits should be used to determine the problems of the supported units and the remedial actions necessary. Information obtained during such visits is analyzed to determine the ways and means in which AVUM and maintenance supply operations can be improved and support to the units made more effective. Functions of the liaison party include, but are not limited to--

- Giving advice to the unit commander on accomplishing his AVUM and repair parts supply functions.
- Advising the unit commander on the efficient use of materiel.
- Following up on repair parts supply requirements of the using unit to insure that the unit is provided all of the tools, repair parts, and cleaning and preserving materials authorized and needed for AVUM.
- Determining the nature and scope of maintenance support required by the unit so that a properly manned and equipped contact team can be sent to perform work that can be accomplished profitably onsite.
- Determining what technical instruction and training assistance are needed by unit maintenance and supply personnel so that they may properly perform their AVUM and repair parts supply functions.
- Providing required instruction when such instruction is within the capabilities of the liaison party.

## CONTACT TEAM

A contact team is organized to provide assistance in resolving problems uncovered by a liaison party and which could not be resolved by the liaison party. Contact teams visit supported units as often as necessary to do the work determined necessary by the liaison party. They are used for such functions as instruction in proper organizational

maintenance procedures, instruction in equipment operation, and advice and assistance in organizational repair parts procedures.

Contact teams are used for performing onsite maintenance. They may also be used to assist supported units in determining the condition of supported equipment and the status of organizational repair parts supply. They may also be used to assist in the maintenance assistance and instruction team (MAIT) program.

### **MAINTENANCE ASSISTANCE AND INSTRUCTION TEAM PROGRAM**

In addition to the logistic assistance program described above, the MAIT program provides technical expertise to help individual unit commanders identify and solve continuing problems which contribute to below acceptable materiel readiness. The sole purpose of the program is to provide expert assistance where needed.

The team will visit a unit with prior informal arrangement being made. The visit may be based on a request by a unit requiring assistance and instruction, or by a unit desiring assistance or instruction for subordinate unit(s). During the arrangement for the team visit, the unit commander should advise the team chief of known problem areas so that proper team makeup can be determined prior to the visit. The visit itself should be conducted to emphasize "what to do and how to do it" in those areas where improvements are needed. Upon completion of the visit, the team chief will advise the commander on recommended follow-on actions to insure unit maintenance program improvement. The MAIT may provide the unit commander with a list of problem areas and recommended actions, but will not score or provide a rating of the unit. Correction of deficient areas of the unit maintenance program not within the responsibility of the unit commander will be followed up by the MAIT with those units or activities needing assistance.

The MAIT is organized to provide assistance and instruction in the following maintenance management and operation areas:

- Equipment condition and serviceability.
- Proper use of tools and equipment.
- Repair parts supply procedures to include direct exchange (DX).
- Maintenance personnel management and training.
- Records and reports management.
- Publications and proper use.
- Shop layout.
- Production and quality control procedures.
- Introduction of new doctrine and techniques.

The MAIT teams replace the former command maintenance management inspection (CMMI) teams. Specific MAIT guidance is contained in AR 750-51.

## SUMMARY

Here are a few key points to remember about aviation logistic assistance:

- Logistic assistance is the advice, assistance, and training provided by recognized maintenance personnel.
- Logistic assistance personnel make up two categories: field maintenance technicians and field supply technicians.
- Three types of contract technical personnel are manufacturer's representative, contract field technician, and contract technical instructor.
- Mobile training teams are controlled by TSARCOM.
- Before requesting logistic assistance, commanders use their own capabilities.
- Aviation logistic assistance information is contained in AR 700-4.
- Logistic assistance is not limited to that provided at the request of the supported unit; it is offered to a unit when information available to the supporting unit indicates AVUM deficiencies.
- A contact team provides assistance in resolving problems uncovered by a liaison party.
- Maintenance assistance and instruction team (MAIT) visits to units stress the "what to do and how to do it" approach.
- Specific MAIT guidance is contained in AR 750-51.

Aviation logistical assistance is an important subject in AVIM but so is the topic of inspections. The next chapter will tell you about inspections.



## CHAPTER 9

# INSPECTIONS

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The maintenance inspection system followed in Army aviation is divided into three categories: scheduled, technical, and other. Scheduled inspections are organizational checks on the condition of equipment. They are made at specific intervals, either after a certain number of days have passed or after the aircraft has flown a certain number of hours. Technical and other inspections are performed on an as needed basis and not according to the calendar. Additionally there are command inspections which are designed to aid the commander in assuring that his maintenance personnel are performing proper maintenance. This chapter discusses each of these inspections covering the following areas:

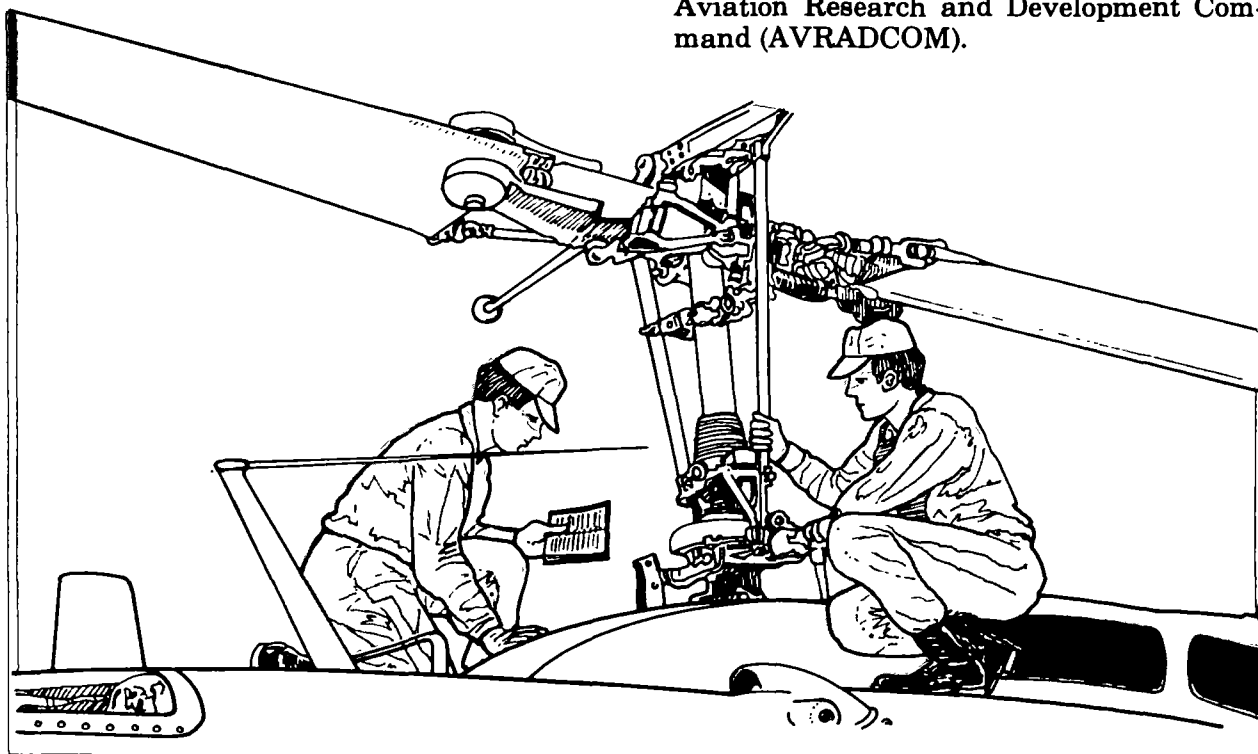
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## INSPECTION FREQUENCY REQUIREMENT

The -23 technical manual for each type of aircraft specifies the intervals between various required inspections. The major responsibility for safe operation of aviation equipment belongs to the using activity; therefore, using activities must be alert in inspecting and replacing equipment. The inspection intervals given in the TM are the maximum and, except in tactical emergencies or civil disaster, will not be exceeded.

Area and local commanders and their maintenance officers not only have the authority to increase the frequency of inspections but are also expected to exercise that authority if it is needed.

A continual evaluation of existing inspection and maintenance requirements is necessary to insure an effective aircraft maintenance program. Recommendations for changes to inspection requirements, as specified in technical manuals, are encouraged and should be submitted to the Aviation Research and Development Command (AVRADCOM).





## SCHEDULED INSPECTIONS

Scheduled inspections are preventive maintenance inspections and are made by aviation intermediate maintenance (AVIM) personnel at stated times.

The three types of scheduled inspections, described in the following subparagraphs, are daily, intermediate, and periodic. All three types are noted on DA Form 2408-13, Aircraft Inspection and Maintenance Record.

**The Daily Inspection** assures continuing safe operation of the aircraft through visual and necessary operational checks. It is made by the crew chief after the last flight of the day or before the next day's flight. If the aircraft does not fly for a few days, the inspection is still good. The exact number of days may be found in the appropriate -23 manual. Removal of cowlings and inspection plates is held to a minimum. Unless discrepancies found during the inspection make it necessary, disassembly of components is not required or desired. The daily inspection includes checking for obvious damage, security of equipment installation and mountings, leaks, compliance with lubrication order requirements, completeness of equipment, engine and equipment operation, and availability of current forms. Aircraft are not considered airworthy until this inspection is completed and noted on the DA Form 2408-13, section 16, and condition status in section 7.

**The Intermediate Inspection** serves to indicate that the equipment is functioning satisfactorily between the daily and periodic inspections. It is usually made 25, 50, and 75 flying hours after the last periodic inspection. The intermediate inspection prevents minor discrepancies from developing into defects that would make the aircraft unsafe or require major maintenance. Access plates and cowlings may have to be removed to make this inspection. The intermediate inspection includes all the requirements of the daily inspection. In addition, the crew chief or mechanic must check wear and damage; chafing of lines, cables, etc.; proper safetying (practice of using wire to keep bolts, nuts, and the like from turning or moving); and battery service.

**The Periodic Inspection** provides a thorough and searching examination of those items subject to failure or deficiencies at intervals determined by experience. Three intermediate inspections are made between periodic inspections. Normally made every 100 flying hours, the periodic inspection requires removal of access plates, panels, and cowlings, and the partial disassembly of certain components. This inspection includes all of the requirements of the daily and intermediate inspections. The inspector must also check for signs of deterioration, proper rigging and alignment, travel and wear tolerances, and proper operation of system and mechanisms. The periodic inspection involves some maintenance and a good deal of disassembly. Therefore, mechanics help with the inspection, but the actual inspection is done by qualified technical inspectors.

## PHASED MAINTENANCE SYSTEM

The phased maintenance system (PMS) is the end result of a study performed in 1972-73 using a computer model. The study, conducted on aircraft component and failure characteristics, showed that aircraft require less frequent maintenance than required by the intermediate and periodic inspection system.

**Specific Objectives** of the PMS are:

- Decrease in maintenance man-hours. Reduction in time an aircraft is grounded for inspection.
- Improved operational readiness.
- Reduction in repair parts requirements.
- Maintenance of present level of aircraft safety and reliability.

**Field Evaluations** of the system disclosed the following advantages:

- More flexibility in managing maintenance operations.
- Significant increase in aircraft availability.
- Significant reduction in maintenance man-hours.

- Significant reduction in spare parts usage.
- The intermediate inspection requirement can be deleted.

### PHASED MAINTENANCE CYCLE

Each phased maintenance cycle is a major scheduled maintenance service. After completion of all phased maintenance services, a cycle is completed and the sequence is repeated. After completion of one cycle, all parts and systems of the aircraft requiring maintenance will have been inspected at least once. At present, the UH-1D/H and CH-47B/C aircraft are undergoing changeover to the system.

|          | Number of phases | Time between phases (flight hours) |
|----------|------------------|------------------------------------|
| UH-1D/H  | 8                | 100                                |
| CH-47B/C | 4                | 100                                |

The remaining models of aircraft in the Army inventory will undergo changeover as inspection checklists are developed for them.

### CHANGEOVER INSTRUCTIONS

DA Circular 750-49 authorizes changeover of aircraft to the PMS. Aviation units will begin changeover to the phased system immediately upon receipt of TB 55-1500-337-34, Phased Maintenance System for Army Aircraft, and the phased maintenance system checklists for each aircraft. Examples of checklist numbers are as follows:

UH-1D/H                      TM 55-1520-210-PM.

CH-47B/C                    TM 55-1520-227-PM.

Since a new checklist is used for each phased inspection, a minimum of three checklists for each assigned aircraft should be on hand at all times.

### AVIM REQUIREMENTS

The PMS primarily benefits aviation unit maintenance (AVUM) level. However, certain items may be required to be inspected at

the AVIM level. If this is the case, those items will be work ordered to the AVIM level by AVUM personnel using DA Form 2407. Standard procedures in TM 38-750, paragraph 3-8, and the AVIM unit's external SOP will be followed.

## TECHNICAL INSPECTIONS

Technical inspections assure the quality of maintenance performed in the maintenance shops. They are made primarily by experienced and specially trained maintenance personnel called technical inspectors. The three technical inspections are initial, in-process, and final.

*An Initial Inspection* is made by technical inspectors when the aircraft first enters the shop. It determines what is wrong with the aircraft and what needs to be done to it. All faults found during the inspection and the maintenance required are entered by the inspector on DA Form 2404.

*The In-Process Inspection* takes place as the work progresses. It is a composite inspection; each job and each phase of the work are checked as each is completed. The technical inspector is not able to check each job himself but he keeps close watch on the work and checks specific jobs that Army regulations require him to inspect personally. The in-process inspection insures that the work is being done properly.

*The Final Inspection* is performed when all maintenance has been completed. It includes the logbook as well as the work performed and is the last step in the quality control process prior to releasing the aircraft for test flight or operational check.

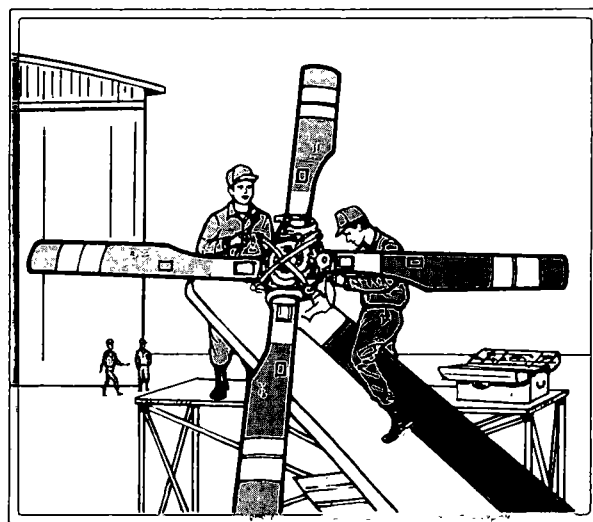
## OTHER INSPECTIONS

Certain events may take place during the life of an aircraft which call for inspections not found in the scheduled or technical inspection categories. These inspections are discussed in this paragraph and include the following: special, acceptance, transfer, one-time, flight readiness, test flight, post test flight, and maintenance operational check.

*A Special Inspection* is one necessary at intervals other than the one set for airframe inspection or airframe operating time. Such inspections include those required because of specific incidents such as hard landings, overspeed, or sudden stops. Inspection on a calendar basis of such details as safety belts, first aid kits, weight and balance, and aircraft inventory; and specific inspections on aircraft engines based solely on operating time. These special inspections are made at the time specified in the aircraft -20 technical manual.

*An Acceptance Inspection* is made on all newly assigned aircraft. Receiving organizations inspect the aircraft thoroughly enough to determine mechanical fitness for flight and completeness of equipment, forms, and records.

*The Transfer Inspection* is made by the transferring organization. It is recorded as the next scheduled intermediate inspection, unless the next scheduled periodic inspection falls due within 25 flying hours; if so, then the next periodic inspection is performed. If a command has jurisdiction over both the transferring and receiving organizations, it may, at its discretion, authorize transfer without completing this inspection. However, the equipment is inspected to be sure it is complete, and forms and records are examined to be sure they are accurate and complete.



*The One-Time Inspection* is made at the level of maintenance specified in the safety-of-flight message or technical bulletin. A technical examination is an inspection to check possible damage to an aircraft or to verify a condition that could affect safety of flight. The one-time inspection for aircraft is recorded on DA Form 2408-13, Aircraft Inspection and Maintenance Record, and DA Form 2408-15, Historical Record for Aircraft. One-time inspections for installed components are recorded on DA Form 2408-13 and DA Form 2408-5, Equipment Modification Record.

*A Flight Readiness Inspection* is made by the aircraft crew before each flight. It insures that the aircraft has been serviced, that there is no damage, and that the necessary forms and records are with the aircraft. Finally, before takeoff the crew checks to be sure tiedowns and covers are removed and there has been no sabotage. The flight readiness inspection is often referred to as the preflight inspection.

*A Test Flight Inspection* is necessary when the proper and safe operation of a component cannot be determined from the ground; it is recorded on DA Form 2408-13. The test flight normally is made during daylight under visual flight rules by the best qualified pilot with the most maintenance experience available. A test flight is mandatory when an aircraft is removed from extended storage; when an engine is replaced; and when certain components are replaced, repaired, or adjusted. Otherwise a maintenance operational check of a component under closely simulated actual working conditions is performed from the ground.

*A Post Test Flight Inspection* is required after each test flight. The mechanic inspects for deficiencies that might have developed during the test flight. Deficiencies must be corrected before the aircraft is released for further flight.

*A Maintenance Operational Check* is made when a component has been replaced, removed, reinstalled, or adjusted--a component which does not need a test flight, such as brakes. The maintenance operational check is recorded on DA Form 2408-13. It is entered by the mechanic or repairman or by the pilot in certain aircraft.

MORE DETAILED INFORMATION COVERING INSPECTIONS MAY BE FOUND IN TM 55-1500-328-25 AND TM 55-411.

## COMMAND INSPECTIONS

Command inspections are performed by the unit commander or the next higher commander. They may be performed as frequently as the commander believes necessary. Two types of command inspections are formal and informal. Both are designed to determine the same points:

- Proficiency of operating personnel.
- Accuracy of supply and accounting procedures.
- Condition of vehicles and equipment.
- Adequacy of the supply of repair parts.
- Evidence of abuse of equipment.
- Compliance with prescribed procedures and regulations.

*Formal Command Inspections.* Formal command inspections encompass all phases of a unit's activities, including performance of personnel. They involve set procedures. To expedite a formal inspection, the unit commander issues a training memorandum that gives pertinent information concerning the inspection. The memorandum is issued far enough in advance of the date of the inspection to allow the unit sufficient time to prepare for it. The commander designates specific individuals, including staff members and technical assistance, to assist him in conducting the inspection.

**Informal Command Inspections.** Informal command inspections are conducted at any opportune time without advance notices. They do not necessarily encompass all phases of a unit's activities but they do provide the commander with first-hand information on the manner in which equipment is maintained and allow him to make on-the-spot corrections should they be necessary.

The supply aspects of command inspections consist of reviewing all files and records that must be maintained at all supply levels. When these inspections are made, the procedures used in requisitioning, receiving, and accounting for supplies are checked. Requests for supplies submitted to supply support activities are inspected selectively to insure that the urgency-of-need designator assigned to the request is consistent with the relative urgency of need for the item requested. When practices are discovered that do not conform to regulations, on-the-spot corrections are made. Files are checked to insure that all appropriate documents are present to account for property on hand as well as for lost or damaged property. Inspectors must also insure that unit commanders and other supply personnel are familiar with supply procedures. An adequate inspection requires the use of a well organized checklist so that important items are not overlooked. A commander's evaluation of maintenance management within his organization is equal in importance to determining the status of equipment. One or more factors in the management of maintenance, at one level or another, is generally the source to which equipment problems can be traced. Inspection reports and readiness reports can usually indicate the presence of problems.

Certain facets of maintenance operations are specifically prescribed in Department of the Army directives. In some cases, only guidance is provided. In inspecting maintenance operations, a commander must distinguish between directives and guidance. Directives must be complied with and are standard for the element of inspection.

Guidance involves nothing more than offering suggestions and pointing out pitfalls. An efficient operation that produces the desired result should be considered satisfactory whether or not it conforms exactly to the guidance provided.

To the extent practicable, supplies and equipment should be inspected onsite. Disruption of the unit's primary mission should be reduced to a minimum so that equipment operator proficiency can be correctly measured. To obtain a complete picture of the supply and maintenance status of the unit, the number of items to be inspected and points to inspect must be determined.

- Determining the number of items to inspect. Whether it be a formal or informal command inspection, the categories and number of items to be inspected are entirely the prerogative of the commander. Inspections of equipment may be conducted on a sample basis with items selected at random (AR 750-1).
- Points to inspect. Although detailed technical examinations of equipment are impractical, the inspections should be thorough enough to reveal major faults and areas of neglect and carelessness. While the commander may have the assistance of qualified technicians familiar with the material to be inspected, he also should make inspections. This is the most critical single element of effective unit maintenance. Because he is not a specialist and because his time is limited, his inspection must be limited in scope. Therefore, tabulations of preventive maintenance (PM) indicators, which are checklists of specific technical inspection points for individual items of equipment as well as various systems, are valuable aids that allow the commander to concentrate on significant, readily accessible inspection points. They afford an excellent indication of the maintenance condition and combat readiness of equipment.

## CORRECTIVE ACTION

Determining by inspection that a less than satisfactory condition exists is of no value unless both the condition and the basic causes are promptly corrected. The maintenance commander must analyze inspection reports and determine not only the seriousness and extent of deficiencies but also why such deficiencies exist. Additional training may be required to perform both preventive and remedial maintenance. In other cases the inspected unit may not have the capability to maintain all assigned equipment, and either additional support should be provided or some equipment placed in administrative storage. An inspection has not accomplished its purpose unless results have been analyzed and necessary corrections made. Various methods are available to the commander to insure that corrections are completed. He may--

- Personally follow the corrective action to completion.
- Direct his staff to monitor the correction.
- Require written reports that corrections have been completed.
- Personally direct immediate corrections.

The thorough commander will not use only one, but a combination of these methods. He will schedule subsequent random inspections to insure that corrections have been made. Only when subsequent inspections show that units are constantly improving can he be sure that his inspections are effective.

## SUMMARY

From what you read about inspections, here are some important points to remember:

- Scheduled inspections are made by AVIM personnel at stated times.
- The phased maintenance system (PMS) provides more flexibility in managing maintenance operations, increases aircraft availability, and reduces maintenance man-hours.
- PMS primarily benefits AVUM level of maintenance, but certain inspection items may be required to be performed at the AVIM level.
- Three technical inspections are: initial, in-process, and final.
- An inspection has not accomplished its purpose unless results have been analyzed and necessary corrections started.

Perhaps it never occurred to you that *aircraft maintenance relies on good communications*. But even if it had, the next chapter points out why this is true.



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## CHAPTER 10

# COMMUNICATIONS

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An effective communications system is important to a maintenance unit. It enables supported units to request assistance quickly and permits proper control of maintenance unit elements particularly those operating outside the main company area. An efficient communications system also enables higher headquarters to send vital tactical and logistical information to the unit. Included is information and warning of radiological fallout and chemical, biological, radiological (CBR) contamination or information on changes in tactical situations that will increase the unit's workload or require displacement of the unit.

This chapter discusses communications in terms of the following:

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## COMMUNICATIONS RESPONSIBILITIES AND POLICIES

Communications units install and operate a network of communications centers spaced throughout a theater of operations. Radio-relay systems connect the various communications centers. Each communications center operates a telephone central, a teletypewriter central, and a communications center which receive and transmit messages for units in its area. The communications unit provides messengers between communications center and supported units. The communications center installs telephone and teletypewriter lines to units within its area. It also operates a radio-wire integration station which interconnects FM radios with the common telephone system.

The distance between a maintenance battalion headquarters and its companies normally exceeds the maintenance unit's wire laying capabilities and may exceed the range of its radios. Therefore, the Army area (or equivalent) communications system is usually the only practical long range communications system available to interconnect the dispersed elements of a battalion size maintenance unit. Communication between a maintenance unit and the units it supports is also provided by the army area communications system. Where practical, each maintenance battalion headquarters and each independently operating maintenance company should have access to a communications center.

Normally, higher authority specifies the maximum distance that wire lines may be installed from an area communications center. The unit operating a communications center installs wire lines to all units within the specified range on a priority basis.

The number of telephone and teletypewriter circuits between a communications center and the aviation support group or company is normally specified by the appropriate command (e.g., army) signal standing operating procedures (SOP). These circuits are installed when the communications center is notified of the move of a unit into its area. When future moves are

planned, the communications center should be notified as soon as possible so that communication can be made available at the new location.

The communications officer of each major command is responsible for allocating the type and extent of electrical communications within the command. The allocations are based on indicated requirements, availability of equipment, and priorities. The communications policies of maintenance units conform to those of higher headquarters.

## COMMUNICATIONS PERSONNEL

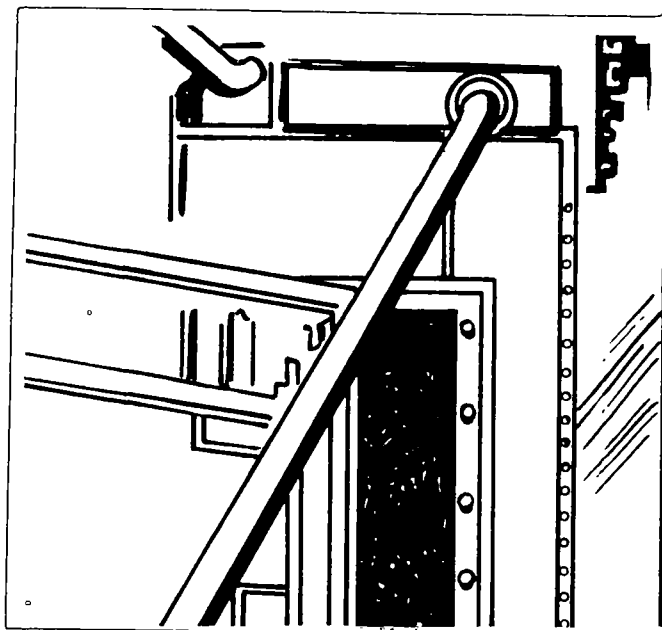
**Communications Officer.** Maintenance battalion and company commanders are each responsible for appointing an officer to serve as communications officer as an additional duty. The communications officer--

- Keeps the commander informed of the communications situation.
- Coordinates communications with higher, adjacent, and subordinate units.
- Prepares communications plans.
- Assists in selecting the site for the unit command post.
- Supervises installation, operation, and maintenance of the unit's communications system.
- Determines communications equipment and supply requirements.
- Supervises or arranges for training communications personnel, including training alternate operators.
- Prepares extracts of communications-electronics operation instructions (CEOI) and communications-electronics standing instruction (CESI) for use by communications personnel.
- Maintains liaison with the communications center support of the area. FM 24-16 will assist unit communications officer in preparing communications orders, records, and reports.

- Prepares diagrams of the unit's organic radio net and wire system and of nets outside the unit which the unit either monitors or in which it operates.

**Radio Operators.** The radio operator is responsible for using correct radio procedures and maintaining communications security. He must be familiar with radio procedures, call signs, and security as described in the CEOI and CESI. He performs organizational maintenance on his radio equipment. He must know the capabilities and limitations of the radio and be familiar with the other stations operating in the radio net.

**Switchboard Operator.** The switchboard operator installs and operates the switchboard. However, for relief of the assigned switchboard operator, other personnel of the company should be trained in switchboard operation as an additional duty. The switchboard operator must know how to install and operate field telephone equipment, capabilities and limitations of the equipment, and other equipment included in the system to which his switchboard is connected. He also serves as a wireman, installs and maintains the field-wire communications system, and performs unit level maintenance on assigned field-wire communications equipment. When initially installing the company wire net, he may require assistance.



## COMMUNICATIONS EQUIPMENT SUPPLY

Authorized communications equipment is listed in tables of organization and equipment (TOE). Additional equipment may be authorized by higher commanders. Initial supply and replacement is made through normal supply channels. The supply sergeant, assisted by the communications officer, prepares requests for communications equipment and supplies. When requesting TOE equipment, such requests must indicate authorization for the equipment, quantity on hand, and quantity due in.

## MAINTENANCE OF COMMUNICATIONS EQUIPMENT

Maintenance by communications equipment operators includes protecting the equipment from weather and rough terrain, cleaning and drying, adjusting, and lubricating. It may also include replacing certain minor parts if this does not require higher technical skills. Unit level maintenance includes troubleshooting and removing and replacing tubes, relays, cables, and modules. When equipment requires repair beyond the organizational maintenance level, it is job-ordered to the maintenance activity for repair.

## MEANS OF COMMUNICATION

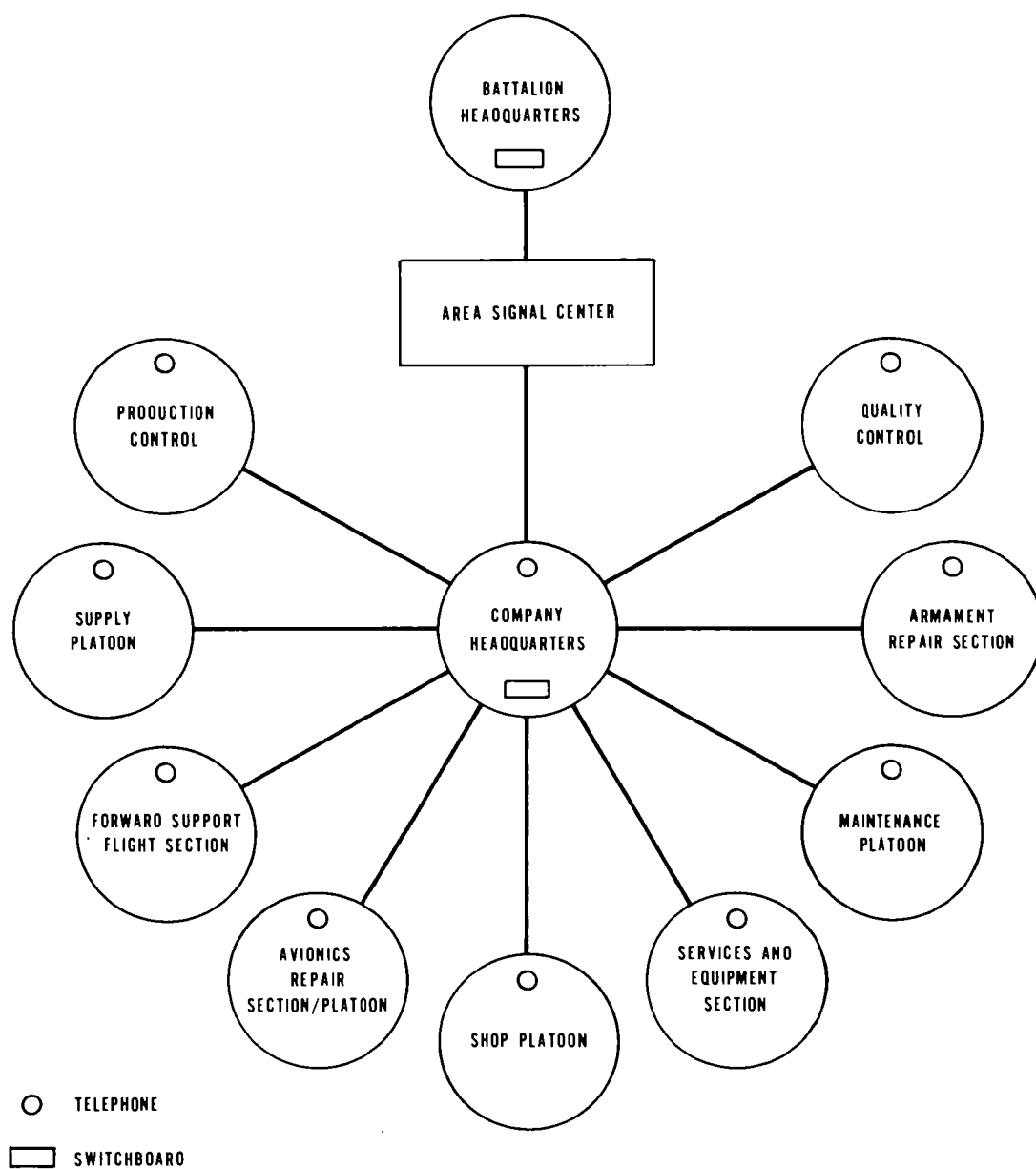
**General.** The various means of communication have different capabilities and limitations. The means used in a given situation is the one that provides the greatest reliability, flexibility, and speed with the least effort, material, and required degree of security. Communications reliability is greatly increased through the use of various means of communications that complement each other.

### *Wire Communication.*

- Wire communication with field telephone and switchboard is highly effective. It affords person-to-person conversation with the capability of interrupting and resuming the conversation. Wire communication is more secure than radio; however, security is never

assured when transmitting in the clear. Wire communication can be used in most terrain and situations.

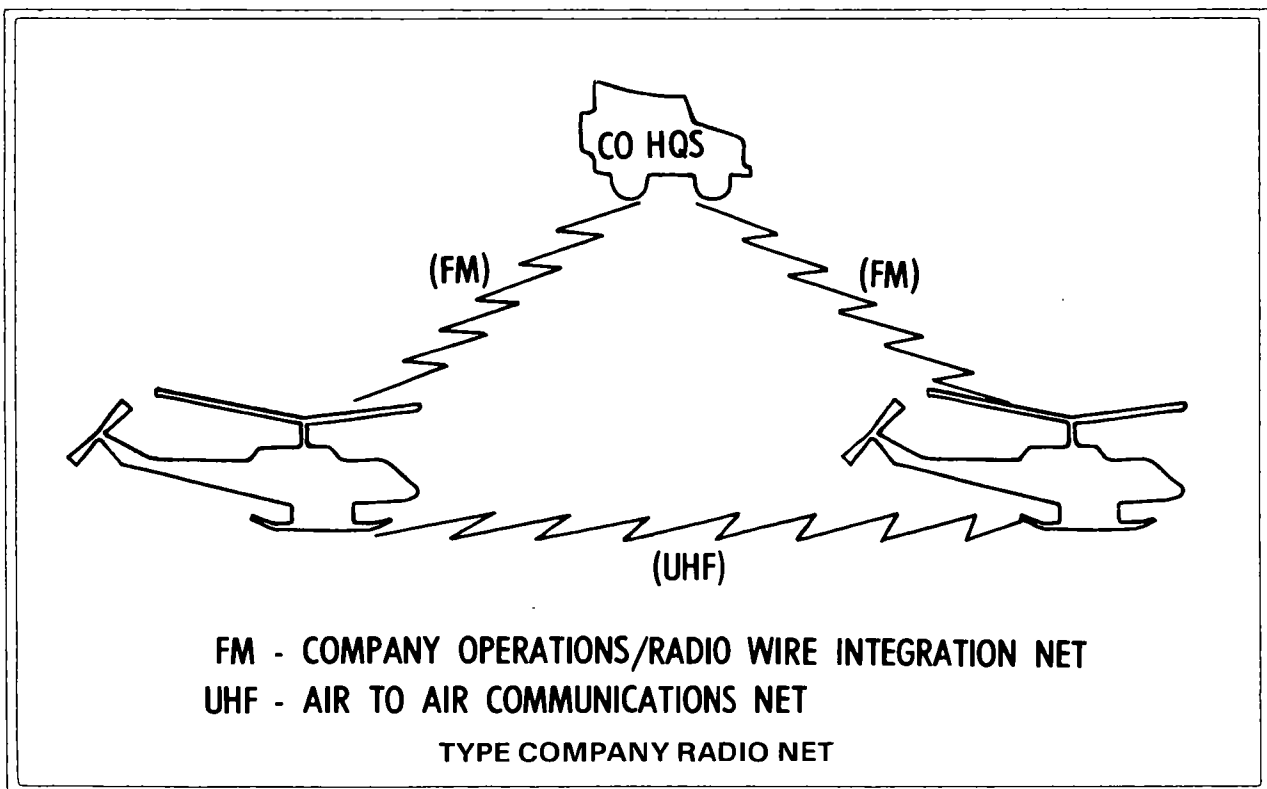
- The operating range of battery-powered telephones using field wire is limited (8 to 13 kilometers). The range of wire communication varies with the weather and the condition of the wire. Wet weather, poor splices, and damaged insulation reduce range appreciably.
- Only a limited number of telephones are authorized to a unit. The best possible use must be made of them. Regardless of the assignment of telephones by TOE, some phones must be borrowed from the operating sections for security use in a tactical situation. During darkness it may be necessary to place all phones except those of the commanding officer and the shop office at key positions on the perimeter. Upon arriving in a new area, the maintenance unit commander must emphasize the need for immediate installation of phone lines. First priority should go to the commander's phone, followed by the perimeter, then the operating sections.
- Wire can be laid by men on foot at the rate of about 3 kilometers per hour, and by vehicle at 5 to 8 kilometers per hour. In estimating the required time, the terrain, weather, enemy action, and visibility must be considered.
- The unit switchboard is used to increase the flexibility of the wire system and to reduce the number of wire lines needed. All telephones are connected to the unit switchboard. The switchboard is connected (perhaps through another switchboard) to a signal center to provide telephone communication with other units.
- Telephones are reserved for occasions where there is a need for discussion and speed. They are not used for long reports or orders when another means can be used effectively. During critical periods telephones may be restricted to designated personnel, except for emergency calls. A type company wire net is shown here.



TYPE COMPANY WIRE NET

***Radio Communication.***

- Maintenance units depend primarily on telephone, teletypewriters, and facilities of the Army communications system. However, these facilities are supplemented by short-range FM radio sets. Units may also be provided AM radio-teletypewriter sets. The number and type of radios provided depends on the unit TOE.
- Companies normally have FM voice radios to supplement their organic wire system. These radios are used to control road movements and company elements operating away from the company area, and for communications with higher headquarters when distances permit. The radios are mounted in vehicles. A type company radio net is shown below.



- Weather, terrain, distance, enemy interference, and crowded frequencies adversely affect FM radio communications. Therefore, land-line telephone is the primary means of communication for maintenance units.

**Messengers.** All units use messengers. They are the most effective way to transmit lengthy messages and to deliver maps and other items. Unit personnel are used as messengers. They deliver messages between the maintenance company and battalion headquarters, and between these units and the nearest signal center. When practicable and depending on message content, the delivery of messages by messenger should be confirmed by other communications or a followup message. Although highly flexible and reliable, messengers are vulnerable to both conventional enemy forces and guerrillas.

**Visual Communication.** Several means of visual communication are available to all units. Flags, lights, pyrotechnics, panels, and arm-and-hand signals can be used. Maintenance units have panel sets to identify their vehicles to friendly aircraft during movement. They are also used to identify the position of the maintenance unit to friendly aircraft nearby. Panels can also be used to indicate drop or landing zones. The panel recognition code for communication with aircraft is normally given in the current CEOI. FM 21-60 contains details for using panels and other visual signals.

**Sound Communication.** Sounds made by weapons, horns, whistles, and sirens may be used to supplement other means of communication. Sound signals must be kept simple to prevent misunderstanding. They are used chiefly to attract attention, to transmit prearranged messages, and to spread alarms. Sound signals are vulnerable to interception and may be prohibited for security reasons. Such signals and their meanings are assigned by commanders. Warning of air, ground, and CBR attacks are usually given by this means. Loudspeakers can also be used to spread alarms and give rapid instructions to reaction forces.

## COMMUNICATIONS SECURITY

Communications security includes all measures taken to prevent or delay unauthorized people from obtaining information from communications. Each commander must insure that his personnel understand and observe communications security.

Maintenance units are concerned with physical security and transmission security.

- Physical security is the protection of classified signal equipment and material, including copies of classified messages. Prior to vacating a command post or any position used for communications, a thorough search is made for copies of classified messages, carbon paper, maps, and orders. Special attention is given to production, distribution, storage, and final disposition of CEOI/CESI items. Compromise of a CEOI, or an extract of a CEOI, must be reported at once. The compromised item must be replaced. The commander states in the unit SOP precisely how the report is to be made. As a minimum, he should require security violations to be reported immediately through communications and command channels.
- Transmission security is designed to make it difficult for the enemy to intercept messages and to use friendly communications for deception. Radio is particularly susceptible to interception, direction-finding, and deception. Radio operators must be thoroughly trained in correct procedures. They must also be constantly alert so as not to divulge information through faulty procedures and techniques. Personnel preparing messages for transmission, as well as radio operators, must be aware of the ability of the enemy to obtain information from radio communications. See FM 32-7 for details on communications security and AR 380-41 for cryptographic security.

The following communications security precautions should be observed.

- Practice silence.
- Transmit in a directed radio net only with permission.
- Avoid unnecessary transmissions such as excessive testing.
- Transmit at a rate that receiving operators can receive.
- Avoid excessive transmitting power.
- Tune transmitters with antennas disconnected.
- Avoid excessive time in tuning, changing frequency, or adjusting equipment.
- Transmit messages by the most secure means available.
- Transmit clear-text messages by voice radio using prescribed radio telephone procedures.
- Preplan wording and content of all messages to be transmitted. Use prescribed authentication systems and avoid all unnecessary verbage.
- Before answering questions received by radio, carefully consider the reply before transmitting the answer. This reduces the possibility of a slip of the tongue.
- Practice a high standard of net discipline at all times.
- Use message books in preparing messages for transmission.
- Use both radio and telephone communications for official information only. Operators are strictly prohibited from using these facilities for personal conversations.
- Use only authorized codes. Personnel must be impressed with the fact that locally devised systems can easily be broken by the enemy.
- Make transmissions brief.
- Do not mention rank or names in transmitting messages.
- Use the phonetic alphabet.

- Do not underestimate the ability of the enemy to intercept messages.

## ELECTRONIC WARFARE

Radio communications systems are vulnerable to enemy electronic warfare activities. The enemy can exploit the information derived through intercept and analysis of friendly communications to degrade or deny command and control through jamming and deception. Commanders must insure that personnel adhere to sound communications security practices and that they are capable of applying appropriate electronic counter-countermeasures (ECCM). Recognition of ECCM and application of ECCM are discussed in FM 24-18 and FM 32-20.



### SUMMARY

Some important points that were made in covering the subject of communications are as follows:

- Communications between a maintenance unit (supporting) and the units it supports (supported) is provided by the Army area communications system.
- The most effective way to send lengthy messages is by messenger.
- Wire can be laid by men on foot at a rate of about 3 kilometers per hour; by vehicle at about 5 to 8 kilometers per hour.
- Radio communications systems are vulnerable to enemy electronic warfare activities. Communications security practices are discussed in FM 24-18 and FM 32-20.

The subject of safety in AVIM operations is worth considering; the next chapter therefore discusses safety.



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## CHAPTER 11

## SAFETY

Injuries and accidents can seriously hamper a unit's operations; therefore, an effective safety program is essential to successful aircraft maintenance operations. Personnel must be impressed with the importance of constant vigilance to detect potential hazards and encouraged to take remedial action to reduce or eliminate danger. The aircraft maintenance commander must insure that his personnel are thoroughly indoctrinated in the proper handling of material, safety procedures to be exercised when using tools and machinery, hazards inherent in operating around aircraft, and other safety principles cited in this chapter.

A maintenance unit commander's safety program has one objective--the prevention of accidents. This chapter discusses such a program in the following areas:

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## RESPONSIBILITIES

**Commander.** The aircraft maintenance unit commander is responsible for insuring that all activities of his unit are conducted in accordance with established safety rules. He is also responsible for determining the cause of accidents and for seeing that corrections are made immediately to prevent their recurrence. He must be aware of and enforce all safety regulations established by higher headquarters. When a deviation from an established safety rule is desired, it is the responsibility of the unit commander to request permission to deviate from the rule. This request, including full particulars and detailed plans and specifications, is submitted to the appropriate headquarters. However, the maintenance unit commander cannot rely on programs of higher headquarters to insure the safety of his men—he must have his own rules, his own program.

**Supervisors.** Platoon leaders and section chiefs exercise direct daily supervision over operating personnel. In their daily contacts with personnel on the job, they are in a position to personally witness working conditions and the hazards to which operating personnel are exposed. Platoon leaders and section chiefs are the persons through whom the full force and effect of all accident prevention measures find application in daily operations. They should have frequent and regular meetings to brief their personnel on safety procedures, to elicit any suggestions on the improvement of safety practices, and to publicize any newly adopted safety procedures. Such meetings should be held in the work area and the agenda for such meetings should include the following items:

- The overall job and the end result expected.
- The why, how, and when of the job and any ideas from the group concerning improvements of methods and procedures.
- The part to be played by each person. The supervisor must make sure that each understands his assignment.

- The existing and anticipated hazards and the steps that should be taken to cope with these problems.
- The need for prompt reporting of all injuries, accidents or near accidents, and the importance of first aid when such action is required.
- The need for constant vigilance to detect and correct unsafe practices and conditions so as to prevent accidents and injuries.
- The establishment and implementation of definite routine safety inspection systems.

**Individuals.** All personnel should be made to realize that safety rules have been established for their protection and welfare. It is the responsibility of each individual to follow all instructions and to use all the safeguards incident to the use of tools, machinery, equipment, and processes. Cooperation among repairmen and their platoon leaders and section chiefs in the development and practice of safe working habits is essential. The effective maintenance unit commander will insure that this spirit of cooperation prevails in his unit.

## PRINCIPLES OF SAFETY

An effective safety program will depend on the proper application of the following principles of accident prevention:

**Creation of Active Interest.** The emphasis of safety in aircraft maintenance units must be vigorous and continuous and must stem from the unit commander. The best safety program in existence will soon deteriorate unless every person in the unit is actively interested and is participating in the program willingly. Interest in safety should be maintained by appealing to the pride of all unit personnel pointing out the responsibilities they have to themselves and to the unit. Any suggestions on improvement of safety operations should be carefully considered. The individual making the suggestion should be given credit if the idea is adopted or an explanation if the suggestion is impractical. Maintenance unit commanders must realize that platoon leaders and section chiefs should be particularly interested in the

effect of accidents on efficiency and productivity. Furnishing them with facts and figures to illustrate how accidents can affect the operation of their sections and, conversely, how increased demands on productivity can increase the frequency of accidents, is very effective in maintaining their interest in the safety program.

**Factfinding.** This principle refers to assembling essential information bearing upon accident occurrence and prevention. With regard to each accident, the following facts should be determined:

- Who was injured or what was damaged.
- The time and place the injury or accident occurred.
- The severity and cost of the injury or accident.
- The nature of the accident or injury.

For accident prevention purposes, the above information must be supplemented with facts concerning the how and why of the accident; in particular, the specific unsafe act committed, if any, along with the reason for its commission and the nature of any specific mechanical or physical hazard, if one existed. If a tool or piece of equipment was a contributing factor, a determination should be made whether the proper tool or piece of equipment was being used, whether it was being used properly, and whether it was defective.

**Corrective Action Based on Facts.** Corrections should be based on available and pertinent facts surrounding the particular accident or injury. In addition to accidents, near accidents must be reported along with all available information, so that existing hazards and unsafe procedures or conditions can be eliminated. Similarly, any procedure or condition which might constitute a threat to safety should be reported so that remedial action can be instituted. Some individuals are accident prone; such a person should be placed in an assignment where he is least likely to endanger himself or others.

## SAFETY PLAN

Some of the elements that should be included in an aircraft maintenance unit safety plan are indicated below. This list is not all inclusive, but the more important elements of a safety plan are as follows:

**Accident Reporting.** A definite procedure should be established for reporting all accidents or injuries, no matter how slight.

**Cause Determination.** The maintenance unit commander or his designated representative should investigate all accidents or injuries to determine their cause and take corrective action to prevent their recurrence.

**Aircraft Crash Plan.** A crash plan designating all geographical areas of the base camp into coded areas for rapid response by crash rescue elements is required to insure minimum confusion in responding to an accident. All crash rescue and operating personnel should be knowledgeable of the crash plan and have it conspicuously posted.

## SPECIAL PRECAUTIONS

**Fire Prevention.** "No Smoking" signs should be posted where fire hazards exist. Fire extinguishers must be conspicuously marked and accessible. Smoking should be permitted only in designated areas. Gasoline, oil, paint, and other flammables should be stored only in approved locations and in containers authorized for this purpose. Oxygen and acetylene bottles must be stored separately from other flammables. In all shop areas, volatile fumes of many types can be the cause of fires. Use of authorized solvents and cleaning materials, proper containers, and good ventilation in these areas will tend to reduce the possibility of fire.

**Vehicle and Equipment Operations.** The maximum number of appropriate personnel should be trained to operate all vehicles, materials handling equipment, and other materiel the maintenance unit is responsible for supporting so they can operate this equipment safely in any emergency. Guides must be posted when towing aircraft, and a person must "ride the brake" on aircraft so equipped.

***Traffic Safety.*** Mobile equipment of any type must be considered as a safety hazard. Vehicular traffic within maintenance areas must be controlled both by speed limits and, if possible, by one-way flow. Other types of mobile equipment such as cranes must have controls established to reduce the possibility of injury to personnel and damage to equipment. It should never be moved within a maintenance area without a ground guide. Wheeled vehicles over one-quarter ton should never be backed without the assistance of a ground guide.

***Firefighting Equipment.*** Items such as fire extinguishers, water containers, and sand containers should be available in all maintenance areas. Fire extinguishers must be of the proper type for fires that could be expected in a particular area. All personnel must be familiar with the location and operation of all firefighting equipment, and frequent inspections must be conducted to insure that all equipment will operate.

***Special Clothing and Equipment.*** All personnel must be thoroughly familiar with the location, use, care, and inspection of special clothing or equipment that they may be required to use; for example, welding mask, goggles, paint respirators, safety shoes, aprons, gloves, etc. When a job requires the use of such clothing and equipment, its use will be rigidly enforced by the appropriate platoon leader or section chief.

***Explosives Safety.*** Every military unit will have some type of explosives within its local area of responsibility. These items include ammunition, grenades, flares, demolition items, and fuels. The maintenance unit commander will require proper storage facilities for and limited access to these at all times. Particular attention must be given retrograde removal of these items.

***Chemical Fluids.*** Certain chemical fluids with bases such as ammonia, including battery acid and cleaning compounds, must be considered as extremely dangerous to both personnel and equipment. These items must also be given proper storage in an area separated from all other items.

***Radiation Safety.*** More and more weapons systems and equipment are being used by the Army that are radioactive. The major hazard from these energy sources is radiation. The high frequency radiation hazard, due to its difficulty of detection without proper test equipment, must be closely controlled. Proper identification, proper storage, and restricted access are mandatory for any item that emits radiation energy.

***Noise Safety.*** Research has revealed that noise is a definite hazard to both the physical and mental capabilities of all personnel. Damage to the ear can result from loud, sharp noises such as artillery fire and from high frequency chatter from machine operations. Continuous high noise levels in both frequency and volume, have a degrading effect on the efficiency of all personnel and can cause complete mental collapse in some cases. The reduction of noise and protection of personnel from noise is a safety requirement in all maintenance unit operations.

***Shop Cleanliness.*** The maintenance area must be kept clean and orderly. Some of the most important subjects that must be considered are immediate cleaning up of oil spills, proper storage of used cleaning rags, control of defective components, proper tool maintenance, and dust control. A scheduled cleanup period of from 15 to 30 minutes each working shift should be mandatory. Numerous hazards to both personnel and equipment can be eliminated or controlled by enforcing high housekeeping standards.

***Horseplay.*** Many accidents are the result of "horseplay" and practical jokes. All personnel should be instructed that maintenance areas are not the place for anything but work. Platoon leaders and section chiefs should not tolerate "horseplay" or practical jokes at any time; any such actions within maintenance areas will be grounds for disciplinary action.

***Carbon Monoxide.*** Carbon monoxide is lethal. Vehicle engines should never be operated inside a building unless there is sufficient ventilation or unless hoses are used to carry exhaust fumes to the outside.

**Painting.** Painting operations should be considered in a well ventilated area, and the same precautions as those for the use of other flammables should be observed. Personnel engaged in spray painting will be required to wear paint respirators.

**Safety Color Code Markings and Signs.** The requirements for safety color code marking of certain vehicles, shop areas, and signs are outlined in AR 385-30, and these regulations should be observed to the maximum extent possible by all maintenance units.

## FLIGHT LINE SAFETY

- Aircraft will be started, run up, or test flown only by qualified aviators or by qualified personnel on current runup orders.
- Observe all WARNING and DANGER signs.
- Move the controls of an aircraft only when necessary. Before moving any controls, check to be sure that no one is working on the aircraft and that control locks are removed.
- Check for the bend radius allowed for each diameter measurement of Teflon hose. Any excess bending may crimp the liner and partially block the hose.
- Brief passengers on the dangers of being hit by the rotor blades when entering or leaving a helicopter.
- Brief all personnel who are operating in the area or the places where aircraft will be landing and taking off.
- Be alert for possible grass fires ignited by the engine or heater exhaust system.
- Be alert for hazardous exhaust temperatures and velocity of turbine engines when working on, operating, or taxiing aircraft equipped with turbine engines.
- Never leave the cockpit of any aircraft before doublechecking to see that switches and battery switch (for turbine engines) are in OFF position.
- Do not work under an aircraft suspended from a hoist without first blocking under the fuselage.
- Never walk near the arc of a propeller or tail rotor blade; be careful around aircraft during engine runup.
- Do not climb or stand on any part of an aircraft except on approved decks or platforms on those areas marked "Step."
- Do not wear cleated soled boots when working on aircraft. Objects become wedged in the cleats and can be a source of foreign object damage (FOD) if they fall into an engine inlet section or become wedged around controls.
- Avoid using the tail rotor guards to rock observation helicopter to get the wheels down. See pertinent maintenance publications for proper methods of ground handling these helicopters.
- Do not rotate main rotor by using tail rotor. The reverse load is detrimental to the tail rotor drive system.
- Do not yank rotor blades around with a rope. This can damage the pockets and spars.
- Do not tie down blades more than 6 inches below their normal position. Excessive bending can result in a permanent "set" to the blade.
- Do not pull rotor through by the blade tips; pull it through from the rotor head.
- Never disconnect a control or take out part of the control system without

tagging the cockpit controls and making appropriate form entry. Disconnection of a control places the aircraft in a red X status.

- Do not jack an aircraft in high winds or with personnel inside.
- Never leave gasoline in an open container. Gas fumes are heavier than air and on a hot windless day can cause a fire many feet from the source of the fumes.
- Do not breathe gasoline fumes; avoid spilling gas on clothing or skin.
- Do not lubricate dirty fittings, nor use a dirty grease gun or containers, nor work with dirty hands. The law of lubrication is to **KEEP EVERYTHING CLEAN**.
- Avoid using grease from a container until the container is wiped clean around the lid, plug, or cap.
- Do not use hydraulic fluid from a can which has been permitted to stand opened and unprotected. Assume that an opened can is contaminated.
- Leave lube container closed when not in use. Tighten the cap or plug on a drum with a wrench; hand-screw the cap on a can as tight as possible.
- Do not paint the bubbles of observation helicopter for protection from the sun. This is not an authorized practice and obstructs the vision of both aviator and observer personnel.
- Prior to grounding aircraft, all armament switches and circuit breakers will be in the OFF position. Aircraft will be grounded at all times during arming and disarming operations and when armed and parked in revetments. Grounding of aircraft should preclude accidental firing of rockets from static electrical energy.

## SHOP AND HANGAR SAFETY

### HANDTOOLS

- Racks, shelves, and/or toolboxes must be provided for tools not in use to assure immediate accessibility and to eliminate hazards created by misplaced or forgotten tools.
- When tools are used on ladders, scaffolds, platforms, or other elevations, special precautions will be observed to prevent them from being dropped from or falling from these levels.
- Tools will be inspected frequently by responsible personnel and defective tools removed from service for repair or salvage.
- Tools with sharp cutting edges will be carried in protective covers.
- All power tools must be equipped with guards, all electrical contacts on power tools inclosed, and all wiring well insulated and grounded.
- Exposed sharp edges should be smoothed down on completion of work.
- Improvised ladders such as packing cases or barrels should not be used.
- When parts or items have been removed from aircraft, they should be stowed out of the way or marked so they can be plainly seen either day or night.
- Sharp edges of material stored should not protrude.
- Electric tools should not be used inside an aircraft. The commutator gives off sparks and is a potential source of ignition.
- Nuts and bolts should be torqued as outlined in appropriate TM. Overtorquing results in destroyed or broken parts.



## WELDING AND CUTTING EQUIPMENT

- During welding or cutting operations, extreme caution will be observed to prevent sparks from starting fires. A fire extinguisher should always be available during these operations.
- Safety goggles will be provided for operators of oxyacetylene equipment.
- During electric welding operations, the operator will wear a hand shield or helmet with a shaded filter glass, and protective sleeves, gloves, and apron. When other personnel are in the vicinity, these operations will be screened off.

### HOUSEKEEPING

- Covered fire-resistant rubbish cans will be used.
- Self-closing covered metal waste cans will be conveniently located about the work area for disposal of oily rags and waste.
- Volatile flammable liquids will not be used for washing or cleaning parts and must not remain in open containers. Working quantities of such liquids will be confined to approved containers.
- Oil should not be dripped or spilled and drip pans or other suitable means should be provided to collect excess oil.

## ACIDS

- Rubber gloves, goggles, and aprons must be provided for all personnel handling battery acids.
- Where acid fumes have a toxic, corrosive, or asphyxiating action, approved respirators will be available.
- Slaked (hydrated) lime should be available for neutralizing large quantities of acid in the event of spillage or breakage of containers. For cleaning

acid from floors or equipment, a 10- to 20-percent sodium carbonate solution should be used. All places made slippery by acid may be adequately neutralized with soda or other alkaline solution and washed with water.

**Static Ground.** To reduce the possibility of fire from accumulated static electricity, all hangared aircraft will be provided with proper grounding devices and they will be grounded at all times.

**Smoking.** Smoking will not be permitted within 50 feet of hangars, parked aircraft, flammable liquid storage points, or inside hangars. "NO SMOKING" signs will be conspicuously posted in restricted areas. The commanding officer may designate specific areas where smoking is permitted.

### FIRE EXTINGUISHERS

- Approved type, conspicuously marked fire extinguishers will be provided in hangars and on flight lines.
- All fire extinguishers will be properly charged and periodically tested, ready for instant use.
- All unit personnel will be trained in the proper use of fire extinguishers.

## ARMAMENT SUBSYSTEMS

The following safety instructions are to be followed when loading or unloading armament subsystems:

- Do not stand in front of any weapon on the aircraft (loaded or unloaded).
- Do not rotate loaded minigun barrels.
- Always use bullet catcher when clearing or rendering safe miniguns.
- Never put arm safe switch to arm position when systems are loaded and on the ground.
- Do not jettison rockets and pods while aircraft is on the ground.

## GROUND HANDLING

- Ground handling of aircraft will be accomplished by personnel who are thoroughly familiar with applicable operator's and maintenance manuals.
- When working around aircraft, wear shoes without metal taps, protruding nails, or cleated soles.
- Walk on authorized aircraft walkways only. Do not step on areas such as transparent inclosures, air scoops, exhaust stacks, or control surfaces.
- All parked aircraft will be effectively grounded by a cable attached to a structural member of the aircraft and to a low resistance ground. Static ground cables will be free of broken strands, and clips will be securely attached to ground points. Attach red-cloth warning flags to grounding cables when they are so located to create a safety hazard to personnel working around the aircraft. See FM 10-69 for ground rod construction and resistance value (keeping resistance as low as possible with 10,000 ohms as the maximum) testing equipment and checks.
- Keeping surfaces on which aircraft are parked free of oil, grease, fuel accumulations, and other debris which would be a potential fire hazard.
- Do not use defective equipment in servicing operations.
- Insure that all weapons are unloaded and removed from aircraft before moving aircraft into hangar.
- General instructions for taxiing, towing, and hand-moving Army aircraft are prescribed by AR 95-1. For specific instructions on a particular aircraft, refer to applicable operator's manual or maintenance manual. Aircraft shall not be moved where or in such a manner that injury to personnel or damage to the aircraft or property could result.

## JACKING AND HOISTING

Refer to applicable manuals on particular aircraft.

## SERVICING AIRCRAFT SYSTEMS

### FUEL SERVICING

Servicing aircraft with fuel requires the utmost precaution due to the highly flammable characteristics of fuel. Personnel fueling aircraft should be qualified and should be thoroughly informed on the safety precautions to be observed. An authorized fuel truck or trailer should be used for fuel servicing aircraft. Drums or barrels may be used for emergency servicing operations. For specific instructions on servicing a particular aircraft, refer to the applicable maintenance manual.

The following instructions are given to insure safety while servicing aircraft with fuel by truck or trailer.

- Evacuate all personnel from aircraft except those actually required during fueling operation.
- Except in areas where tactical hot point refueling is authorized, aircraft will not be towed, taxied, or engines run up within 50 feet of any fueling operation or within 50 feet of any spilled fuel until spilled fuel has been removed and area rendered safe.
- No aircraft electrical switches shall be operated except those mandatory for servicing.
- Maintenance and armament servicing adjacent to aircraft being fueled is restricted to a distance of 50 feet or greater.
- A distance of not less than 10 feet from other aircraft shall be maintained by servicing units during fueling operations.
- Aircraft will not be fueled when an electrical storm is within a 3-mile radius.
- Avoid servicing aircraft within 120 feet of drainage ditches or low places where combustible fumes may accumulate.

- Airborne radar equipment will not be operated within a 30-foot radius of a fueling operation.
- All ground radar transmitting equipment within a radius of 300 feet of fueling operations will be deenergized.
- Aircraft will not be fueled within 50 feet of hangars or structures.
- Auxiliary operating equipment such as ground power units, ground heaters, air compressors, etc., which are not required in the fueling operation will be kept clear of the aircraft.
- Under no circumstances shall any item of ground powered equipment be parked under any part of any aircraft being serviced.
- Wind direction will be considered so that fuel vapors will not be blown toward a possible igniting source.
- A fully charged, 50-pound-capacity carbon dioxide, or equivalent, fire extinguisher will be located strategically during fueling operations.
- Access to fire extinguishers on vehicles will not be obstructed.
- Clear paths shall be maintained at all times around aircraft being serviced to permit rapid evacuation of fueling vehicles and personnel.
- NO SMOKING precautions shall be observed within a 50-foot radius during fueling operations.
- Metal backed mops or brooms will not be used to clean up fuel spills on concrete surfaces. All mops and rags should be of cotton material.
- If a major spillage of fuel occurs, all ground powered equipment shall be shut down. All personnel shall leave the vicinity and be positioned around the aircraft to prevent any powered equipment or sources of possible ignition from entering the area. The fire department shall be notified and render the area safe prior to moving aircraft or equipment. If a fire occurs, every effort shall be made to move aircraft and servicing unit to a

safe place. Large fuel spills may be blanketed with foam or washed away with water and allowed to dry or evaporate before the area is used again. Small amounts may be absorbed by cotton rags or absorbents. The fueling units shall maintain a distance of 20 feet between unit and filler point. A minimum distance of 10 feet shall be maintained between fueling unit and aircraft.

- A static ground cable shall be connected from servicing unit to ground stake; a cable shall be connected from aircraft to grounding stake and another cable shall be connected from aircraft to servicing unit at low resistance grounds, preferably the landing gear strut and to piping on servicing unit. To obtain the safety advantage from use of the ground wire, it must be used in proper sequence. Be sure to attach the ground wire prior to opening the fuel tank and inserting the fuel nozzle.
- All venting doors on servicing unit shall be open.
- Avoid contact of fuel with skin. When contact cannot be avoided, wash skin with mild soap and water.

## DEFUELING

Defueling aircraft requires the utmost safety precautions. Due to the highly flammable characteristics of fuel, personnel shall be well informed of the steps to take in case of emergency to prevent hazardous injuries.

- The steps listed for fuel servicing shall be complied with during defueling operations.
- Do not operate any open-flame device, reciprocating engines, or jet engines within 50 feet of aircraft being defueled.
- Manpower used in defueling operations shall be held to a minimum but be adequate to stop all servicing equipment in the event of an emergency.
- Notify service unit operator as accurately as possible of the amount of fuel involved in each operation.

- Position service unit as far away from aircraft as hose will permit and in a position so that it may be driven or towed away from the area in event of an emergency.
- Visually check fuel hose for breaks or worn spots. Replace damaged hose before defueling.
- Fuel servicing unit attendant shall not leave servicing unit while it is connected to aircraft.
- Ground aircraft in accordance with ground handling procedures discussed above.
- When defueling operation is complete, disconnect grounding cables in reverse order of attaching.
- Personnel handling fuel hose nozzle shall discharge static electricity from their persons before handling or touching metal in vapor area.
- Do not block nozzle in open position. Nozzles will be operated manually at all times.
- Open and close nozzle valve slowly to prevent kickback of nozzle and high pressure surge.
- Position a person on top of servicing unit to observe fluid level and prevent overflow.
- Use only properly marked and electrically grounded containers when manually draining fuel from tanks.
- A standby firetruck is recommended during a complete defueling operation.
- Tank filler caps will be removed and all sources of spark or flame prohibited.
- Under emergency conditions or where the aircraft cannot be moved, it may be defueled inside a hangar. When defueling operations are carried on inside a hangar, the main doors will be open and all shop doors leading into the hangar closed.

## OIL SERVICING

Oil servicing precautionary measures are required due to the flammable nature of oil. General precautions for oil servicing are the

same as for fuel servicing. Additional safety precautions for oil servicing and draining are as follows:

- Drip pans will be installed where practicable.
- Caution will be exercised to prevent overfilling or spilling. When oil has been spilled, remove spillage from aircraft and adjacent area. Clean rags may be used for this purpose. Sand, dirt, sawdust, or commercial products may be used to remove oil spillage from adjacent ground. Never use flammable solvents to remove oil spillage.

## HYDRAULIC FLUID SERVICING

- Do not overfill reservoir or spill fluid in surrounding areas.
- If fluid is spilled, absorb with clean rags.
- When filling reservoirs, make sure that no dirt or foreign matter enters the system.
- Refer to applicable aircraft maintenance manual for additional servicing and maintenance instructions. Use only specified hydraulic fluid.

## PNEUMATIC SERVICING

Safety precautions for servicing pneumatic reservoirs are as follows:

- Never use pressure oxygen to inflate gear shock struts, pressure accumulators, etc.
- Use only clearly labeled compressed air cylinders or compressed air hoses of known origin.
- Insure that locking mechanism on aircraft valve stem is engaged after servicing.
- Fill system slowly to avoid heat generated by filling too rapidly.
- Be careful not to overcharge the system.
- Completely discharge pressure prior to removing a component from the system.

## SERVICING OXYGEN SYSTEMS

Before servicing any aircraft, consult the specific aircraft maintenance manual to

determine the proper type of servicing equipment to be used. Two persons are required to service an aircraft with oxygen; one stationed at the control valves of the servicing equipment, and one stationed where he can observe the pressure in the aircraft system. Communication between the two people is required in case of an emergency. Aircraft should not be serviced with oxygen during fueling, defueling, or other maintenance work which could provide a source of ignition. Aircraft should be serviced with oxygen outside hangars.

Gaseous oxygen is dangerous and must be handled properly. It causes flammable materials to burn violently or even to explode. Listed below are several precautionary measures to follow:

- Tag all reparable cylinders that have leaky valves or plugs.
- Don't use gaseous oxygen to dust off clothing, etc.
- Keep oil and grease away from oxygen equipment.
- Don't service oxygen systems in a hangar because of the increased chances of fire.
- Valves of an oxygen system or cylinder should not be opened when a flame, electrical arc, or any other source of ignition is in the immediate area.
- Properly secure all oxygen cylinders when they are in use.

### PARKING AND MOORING FIXED AND ROTARY WING AIRCRAFT

The following general instructions are applicable to Department of the Army aircraft. For specific instructions on parking and mooring particular aircraft, refer to the applicable maintenance manual.

#### GENERAL INSTRUCTIONS FOR ALL AIRCRAFT ARE AS FOLLOWS:

- Do not park or moor aircraft closer than wing or rotor spar, except by authority of the commanding officer or his designated representative.

- When aircraft are to be parked in rows, position aircraft in adjacent rows to most effectively reduce propeller wash during engine operation.
- When possible, park aircraft in such a location or direction that transparent inclosures are not in the direct rays of the sun.
- Install gear locking devices (when applicable).
- Allow sufficient slack in the mooring rope to prevent stress on ground fittings, rope, mooring devices, or aircraft structure due to tire or strut inflation or deflation, or wet rope shrinkage.
- Place fully charged, 50-pound, carbon-dioxide-type fire extinguishers in readily accessible areas where aircraft are parked.
- When aircraft are to be moored for storage, they shall not be parked less than 750 feet from center of nearest taxiway. Provide adequate clearance for maintenance, fire lanes, and taxiways.

#### GENERAL INSTRUCTIONS FOR FIXED-WING AIRCRAFT ARE AS FOLLOWS:

- Place chocks fore and aft of main landing gear wheels. Do not use parking brakes as substitutes for chocks. Use steel chocks for snow or ice operation only. Use sandbags on steel matting. Use wooden chocks for all other operations. Set brakes only after they have cooled.

#### GENERAL INSTRUCTIONS FOR ROTARY-WING AIRCRAFT ARE AS FOLLOWS:

- When parking is for overnight, storage, or during adverse weather, set ground handling wheels (when applicable) in retracted position. Rotate or fold main rotor blades and moor in accordance with instructions contained in applicable maintenance manual.

## ENGINE OPERATION

Following are general instructions for operating engines on Army aircraft; for specific instructions on a particular aircraft, refer to the applicable operator's manual.

### SAFETY PROCEDURES PRIOR TO STARTING ENGINES ARE AS FOLLOWS:

- Head aircraft so that exhaust blast is directed to least inhabited areas.
- Place approved chocks fore and aft of main landing gear wheels.
- Clear wings and surrounding areas of covers, tools, rags, workstands, etc., and remove mooring ropes.
- Secure access doors by closing or removing prior to ground testing turbine powered aircraft engines.
- Do not allow personnel on any external portion of an aircraft during engine start or operation.

**WARNING: WHEN STARTING AN AIRCRAFT WITH TURBINE ENGINES, IT MUST BE HEADED INTO THE WIND TO PREVENT FLAME-OUT OR HOT START.**

- Station a crewmember, equipped with an approved fire extinguisher, in view of operator and to one side near rear of engine being started, to observe for fire and fire hazards such as fuel from overflow lines, etc., and to observe for chock slippage. This same crewmember will make periodic visual checks for fuel and oil leakage and other irregular conditions.
- Station a responsible ground crewmember to one side near rear of operating turbine powered aircraft to warn approaching traffic.
- Use a danger flag when necessary.
- When preoiling an engine, keep area around the propeller clear of personnel and equipment. Rope off area if necessary.

### SAFETY PROCEDURES DURING ENGINE STARTING ARE AS FOLLOWS:

- Use hand signals for directing activity when engine operating noise will not permit voice communication.
- Avoid excessive fuel pressure when starting turbine engines.
- When fire occurs during engine start or while operating, the operator will endeavor to extinguish the flames, as outlined in applicable operator's manual. Should this action fail, the fireguard shall take immediate action with approved fire extinguishing agent provided. Should fire get beyond control of operator and fireguard, all available approved means of extinguishing an aircraft or engine fire shall be used.
- During start and while engines are operating, personnel shall stand well clear of propellers and of areas affected by turbine air intake flow and exhaust blast.

### SAFETY PROCEDURES DURING ENGINE OPERATION ARE AS FOLLOWS:

- Do not operate engines in hangars.
- Do not operate aircraft engine where propeller or turbine blast would cause injury to personnel or damage to aircraft and property.
- When necessary to approach close to aircraft while engines are operating, allow due clearance for propellers and for the effects of turbine inlet suction and exhaust blast.
- No person, vehicle, or aircraft shall pass closer than 200 feet to rear of turbine-powered aircraft, or closer than 100 feet from other type aircraft unless engine is idling and operator is aware of such activity.
- Personnel shall remain at least 25 feet away from front of operating turbine-powered aircraft inlet ducts, and will not approach closer than 5 feet to inlet ducts from rear or side of aircraft.

- Personnel shall not stand in line with the red stripe painted on fuselage or engine nacelles. This stripe designates the plane-of-rotation of a turbine wheel or propeller which is a danger area.
- Do not wear loose-fitting clothing when close side approach to operating turbine-powered aircraft air inlet duct is required.
- Do not carry loose items such as small tools, rags, cigarettes, etc., in pockets when close side approach to operating turbine powered aircraft air inlet ducts is required.

**SAFETY PROCEDURES AFTER OPERATING ENGINES ARE AS FOLLOWS:**

- It is imperative that the fuel switch of an aircraft engine be in OFF position when engine is not operating. Master battery switch shall be turned OFF when no longer required.
- During engine cooling period, all personnel shall remain clear of powerplant exhaust system.

**GENERAL INSTRUCTIONS PECULIAR TO ROTARY-WING AIRCRAFT ARE AS FOLLOWS:**

- When authorized ground personnel run up engine, lock collective pitch stick in full low position.
- A quick, excessive throttle start could swing the tail rapidly, with possible injury to personnel or damage to equipment from the tail rotor. Keep personnel and equipment clear of aircraft at a distance at least equal to its length.
- Stand clear of plane-of-rotation during operation.
- Main rotor blades tend to droop at decreased speeds; approach with caution, especially blades with a low plane-of-rotation.
- When practicable, make adjustments to engine and rotors when engine is stopped.

## SUMMARY

Briefly, here are a few of the main thoughts about safety in an AVIM unit:

- The aircraft maintenance unit commander is responsible for insuring that all activities in his unit are conducted in accordance with established safety rules.
- Safety principles include creation of active interest, factfinding, and corrective action based on facts.
- A safety plan should include accident reporting, cause determination, and aircraft crash plan.
- Special precautions must be a part of any safety program. Important items include fire prevention, traffic safety, chemical fluids, radiation and noise safety, shop cleanliness, and horseplay.
- Flight line safety must be enforced and all rules and regulations governing flight line safety must be posted where all personnel can read.

You have had an opportunity to read about AVIM policies, procedures, and operations. A meaningful way to draw this manual to a close is to discuss maintenance training in terms of program objectives and systems for training. The next and last chapter does this for you.



CHAPTER 12

MAINTENANCE TRAINING

Training is of direct concern to all commanders, staff officers, and other leaders. It influences the accomplishment of tasks for which they have responsibility. This relationship requires that the training program be thoroughly coordinated with all staff sections concerned. Each staff section, without degrading the primary staff responsibility (S-3), supervises some training.

As the complexity of Army aircraft and components increases, the required skill for the aircraft mechanic must also increase. Therefore, training becomes more important with each new item of equipment introduced into the system. Because of the highly technical nature of aircraft maintenance training, it is desirable for all aircraft repairmen to be service school trained. However, institutional (school) training does not reduce the need for training in the unit. Maintenance training must be a continuous process. The individual must be further trained in his primary military occupational specialty (MOS) while being cross-trained in other skills and MOS. Cross-training of aircraft maintenance personnel in supply procedures promotes greater understanding of the problems of both areas and creates a reserve of personnel in the supply field. Responsibilities and concepts of military training are covered in TC 21-5-7 and FM 21-6. This chapter describes the following:

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## AVIATION TRAINING PROGRAM OBJECTIVES

A training program must have a purpose; and the purpose of a personnel training program is to provide qualified personnel, an expandable program, career advancement, and a training base.

*Qualified Personnel.* The first objective of an aviation training program is to provide personnel qualified to maintain all types of Army aircraft and components. With the many different types of complex aircraft, personnel must be trained to maintain specific types of aircraft and in specific components. Training in aviation unit maintenance (AVUM) and aviation intermediate maintenance (AVIM) may be in any one of four fields. First, in the 67 career group, a repairer may learn to maintain single and multiengine airplanes or single or tandem rotor helicopters. Second, in the 68 career group, a repairer will learn to repair the components of the aircraft; for example, he can learn to repair the power train system on all aircraft. Third, he may learn to inspect aircraft, either fixed or rotary wing. And fourth, he may learn to supervise maintenance operations.

*Expandable Program.* The second objective is to establish a program that can expand readily when necessary. The availability of Army aviation assets may vary rapidly as dictated by the political and military situation. Additional organizations may be required on short notice to support the augmented assets. Moreover, an expandable program is needed to provide additional units with qualified personnel when needed.

*Career Advancements.* The third objective is to provide a career program for enlisted men in aircraft maintenance to give them opportunities for advancement. A lot of time and money is spent training men in this highly technical field and we must make every effort to retain them. A well defined pattern of career progression is built into the MOS structure to serve this purpose.

*Training Base.* A training base is required to retain the skill levels of training personnel. Personnel must have continuous training and working experience to retain their skills.

## SYSTEMS FOR TRAINING

The two primary systems for training aircraft repairers are service schools and on-the-job training.

*Service School Training.* Aircraft maintenance personnel are trained in skill level 1 courses at the US Army Aviation School (USAAVNS), Fort Rucker, Alabama, and at the US Army Transportation School (USATSCH), Fort Eustis, Virginia. Graduates (apprentices) of these courses are awarded the appropriate MOS.

*On-the-Job Training.* On-the-job training (OJT) is received during the actual performance of duty. It is an integrated portion of the unit training phase. It may be used to qualify an individual for a given MOS when service school training is not possible, or to increase his proficiency in an MOS in which he is already qualified. The trainee must spend a portion of his time in a productive capacity on the job. The best technique is to group the experienced, preferably school-trained specialists with individuals with less training experience. Thus, the lesser trained repairman learns from an experienced specialist and then applies what he has learned, thereby gaining valuable practical experience. In conducting an OJT program, keep the following points in mind:

- Maintenance training is a continuing necessity and OJT is always required.
- Training is the responsibility of the supervisor, the trainee, and the entire unit.
- The unit mission is paramount.
- A training program must include an instructor and a trainee.
- A successful training program must be flexible.

### ***Training Publications and Materials.***

Service schools have increased their efforts to produce improved training literature and materials and provide greater assistance to trainers and training managers. These materials have been developed to maximize mission, time, and cost effectiveness. They may be used at both the service school as part of a formal course of instruction and at the unit level as a basis of an OJT program. These training publications are as follows:

- ***Soldier's Manuals (SM).*** Soldier's manuals provide the basis for individual training and evaluation. Each SM specifies (by MOS skill level and duty position) critical skills a soldier is expected to master. And the SM gives the conditions and standards that must be met for the soldier to be considered proficient.
- ***Training Extension Course (TEC).*** TEC lessons are instructional material designed to enhance individual training and evaluation in units. Available from service schools to units in the field, TEC is a unique blend of multimedia components. Based on the principle of self-paced learning, it offers step-by-step instruction in the critical skills needed by each soldier to perform his job. Some lessons include film strips or slides; others, audiotapes and written materials. TEC's available cover a wide range of both basic soldiering and specialty skills to be mastered by the soldier, with integral evaluation methods to be monitored by the training supervisor.
- ***Skill Qualification Test (SQT).*** The SQT replaced the old MOS test and is divided into three parts: written, hands-on, and the commander's certification. All parts of the evaluation are performance oriented--a written portion measuring skills a soldier should have at his current skill level, and those skills he or she should have to qualify for promotion in that MOS to the next higher

grade. Hands-on evaluation allows the soldier to demonstrate by performance his knowledge and skill. This evaluation is in addition to the written test. The SQT does two things:

- It verifies the current skill level of the soldier. The soldier must pass if he or she wants to retain the current MOS or even stay in the Army.
- The SQT score identifies a soldier for the stripes of the next higher grade.
- ***Army Training and Evaluation Program (ARTEP).*** The ARTEP replaces the applicable Army training program (ATP) and Army training test (ATT). ARTEP's are specifically designed for Active Army and Reserve component training in today's training environment. They set forth the collective performances for the crew/squad through the battalion/separate company echelons and, more important, the minimum acceptable standards of performance these elements must meet. In addition to stating "what" and "how well," other information such as estimated training resource requirements (ammunition, opposing forces, maneuver areas, etc.) and tips to trainers and evaluators are included.

***Methods.*** The following training methods are basic to well-planned training programs:

- ***Direct supervision (apprentice of coach-pupil methods).*** Coach-pupil instruction is one of the best methods of OJT and is the quickest way to fit a trainee into the operation of a unit. Without specific direction and guidance in learning to perform duties, a new trainee is likely to waste time and material and develop poor work habits. An experienced repairman is able to teach a trainee timesaving procedures, the necessity of using a torque wrench, that safety is everybody's business, and that technical manuals (TM) must be used in performing maintenance.

- *Self-study.* Skilled maintenance duties require considerable job knowledge and judgment. Even simple jobs involve a great deal of basic information that the repairman must acquire. Training given through direct supervision is seldom complete within itself in developing basic repairmen into skilled, advanced specialists. Use of the SM will tell an individual what he needs to know to be proficient at various stages of his career. SM will provide general information about an individual's MOS and where to go for specific guidance. Repairmen who come to the organization with a fair technical background and some experience can acquire through study of pertinent technical publications most of the knowledge needed in the skill for which they are striving. If six trainees are learning the same process and four of them have difficulty with a portion which the other two perform well, the four having trouble can work with the other two, and usually in a short time resolve the difficulty. Other advantages of this instructional method are as follows:

- Is a timesaver when several trainees are to be instructed in the same method or procedure.
- Provides opportunity for open discussions and group problem solving.
- Develops judgment.
- Provides time to motivate the trainees.
- Leads to cooperation among the trainees.
- Allows the supervisor or trainer to check progress and to clarify matters which are difficult for the trainee to understand.

*Implementation.* When implementing OJT, the supervisor must--

- Determine the exact need for training by establishing the specific job requirements and the individual skills of

the trainee. When these two factors are known, this formula may be used: the specific job requirements minus the individual skills of the trainee equal the OJT required.

- Determine the method or methods of training which will be most effective. The number of people, time available, facilities required, nature of training, and individual capabilities are factors which will affect this decision.
- Select the people who will conduct the training, remembering the success of the program depends on those who conduct it.
- Procure training aids and handouts applicable to the program.
- Survey unit assignments to insure that each assignment fits the individual's classification, skills, and background.
- Insure that the program is active, that training records are kept current, and that newly developed skills are being used.

*Maintenance Training Standards.* Any OJT program, for a prospective maintenance crewman or for a specialist studying for a higher and more complex MOS or skill-digit level, must be complete and comprehensive enough to meet the standards of instruction maintained at the service school. These standards can be maintained by coordination with the service school individual training plans (ITP) and by the use of master lesson plans prepared for MOS training.

*Training Suggestions.* In addition to the instructor's information in FM 21-6, the supervisor of OJT can improve the presentation and have a more successful program by--

- *Teaching the trainee to have pride in his work.* The instructor's attitude is reflected in the trainee's performance. Hence, he should insure that every detail of the trainee's performance is of the highest standard. When practical, in the case of aviation maintenance, the trainee may be sent on flights in the aircraft on which he performed the maintenance.

- **Teaching the trainee what to look for.** At first, the trainee may see only the most apparent faults when he inspects equipment or an engine. As his training progresses, he will see the broken tube or the chafed conduit. The instructor should show and explain to the trainee the things to look for when inspecting.
- **Rotating the trainee.** Rotation (cross-training) of the trainee on several phases of the MOS contributes significantly to a good OJT program.
- **Giving the trainee definite reading assignments.** Assignment of study material in technical manuals (TM) and other publications pertinent to the MOS speciality is an important aspect of teaching. The TM's on the equipment associated with the MOS are excellent for helping the trainee learn the basic principles of the MOS.
- **Giving the trainee practice problems.** During OJT, paperwork relative to the MOS specialty should be discussed. The trainee is given problems in requisitioning a repair part and in completing forms and records. These projects help him understand approved working methods through practical exercises and actual practice.
- **Making necessary changes in the program.** As TM's, technical bulletins (TB), and other publications change, the references used in the training program must be changed. The local situation, operational problems, and emergencies demand a flexible OJT program.
- **Measuring the trainee's progress.** The trainee should be tested at the beginning of the course. His workpapers should be collected, corrected, and saved. After a reasonable length of time, the same text questions should again be answered by the trainee, with the results compared. In this way, the trainee's progress can be recorded in a practical manner and his deficiencies noted for further training.

- **Keeping a checklist of the trainee's progress.** A checklist should be kept to record the trainee's progress. It should be flexible enough to conform to the day-to-day operation, yet rigid enough to present a true picture of the trainee's progress.

**Instructor.** The job knowledge of the OJT instructor must be firm and practical--he must know the practical aspects of the subject as well as the theoretical. Trainees respect a man who can do the job as well as talk about it. An instructor must have the ability to present the material to others; he must also be able to use commonsense in instructional problems. The principles outlined in TC 21-5-7 for the selection and training of instructors must be followed. Basic points to be considered when selecting instructor personnel are that instructors should--

- Be qualified repairmen or technicians and have at least 6 months experience.
- Receive special training in controlled observation (on-the-spot correction).
- Receive refresher training.
- Receive special training in conducting and scoring tests.

### A WORD ABOUT NIGHT MAINTENANCE TRAINING

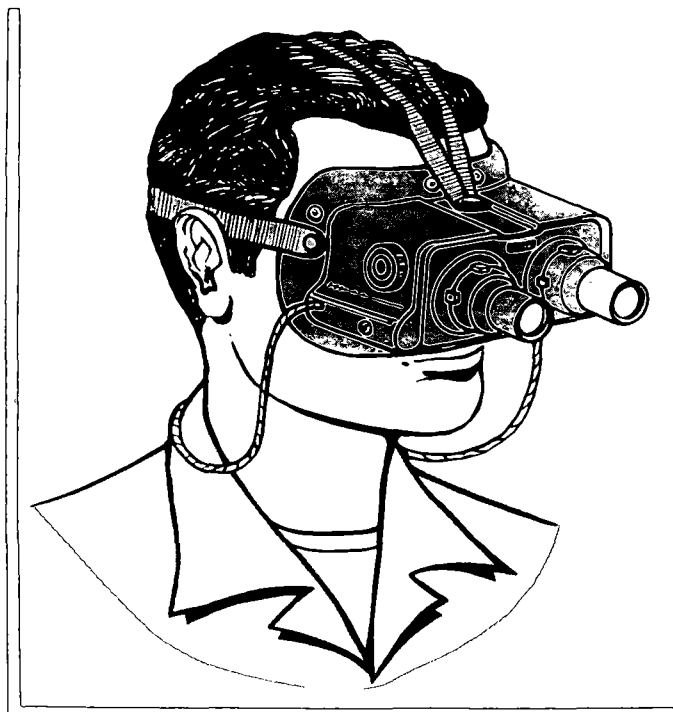
When setting up a training program for night maintenance, the following physical actions should be taken as a minimum:

- Practice the sense of feel under limited light conditions. Learn to identify--
  - Tools.
  - Safety wire sizes.
  - Parts.
- Learn to perform manual tasks by--
  - Tightening nuts.
  - Safety wiring.
  - Servicing for fuel or oil.
- Practice the movement of aircraft.

- For technical inspectors (TI's) have them practice identifying the following:
  - Cracks.
  - Working rivets.
  - Seepage of fluids.
  - Dents.
  - Fluid levels.
  - Foreign object damage.
  - Excessive or insufficient tolerances.
  - Chafing.
  - Improper installation of repair parts or equipment.

Some items of equipment for a training program are--

- Table of organization and equipment (TOE) light sets.
- AN/PVS-5 goggles (shown below).
- Chemiluminescent lights.
  - Head lanterns with red and green filters.
  - Reflective tape.
  - Strobe light.



**GENERALLY, TOE LIGHT SETS ARE NOT USED FOR REPAIRS DONE IN THE OPEN. BUT THEY CAN BE USED TO BUILD UP CONFIDENCE IN NIGHT MAINTENANCE TRAINING.**

## SUMMARY

Now that you have read the chapter covering maintenance training, you should have some ideas about how aviation mechanics in a unit are kept current in their skills. Let's check out a few of the points that were discussed:

- ② School training does not reduce the need for training in a unit.
- ② Cross training of aircraft maintenance personnel is essential.
- ② The purpose of a training program is to provide qualified people, an expandable program, career advancement, and a training base.
- ② Two primary systems for training aircraft repairers are service school and on the job.
- ② Training publications and materials designed to help soldiers in an OJT program or in their career progression are SM, ARTEP, TEC, and SQT.
- ② Training methods include direct supervision and self-study.
- ② Field Manual 21-6 is the "bible" for providing training information.
- ② Night maintenance training is a must in today's Army.





## APPENDIX A

**REFERENCES**

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The following references should be checked frequently for latest changes or revisions relating to material covered in this manual.

**Army Regulations (AR)**

|        |                                                                       |
|--------|-----------------------------------------------------------------------|
| 11-14  | Logistic Readiness                                                    |
| 95-16  | Weight and Balance Army Aircraft                                      |
| 310-49 | The Army Authorization Documents System (TAADS)                       |
| 710-2  | Material Management For Using Units, Support Units, and Installations |
| 750-51 | Maintenance Assistance and Instruction Team (MAIT) Program            |

**Field Manuals (FM)**

|        |                                                                          |
|--------|--------------------------------------------------------------------------|
| 1-100  | Army Aviation Utilization                                                |
| 10-69  | Petroleum Supply Point Equipment and Operations                          |
| 21-6   | How To Prepare and Conduct Military Training                             |
| 29-20  | Maintenance Management in Theaters of Operations                         |
| 29-25  | Direct Exchange, Shop Supply, and Operational Readiness Float Procedures |
| 29-27  | Calibration Service in the Theater of Operations                         |
| 29-45  | General Support Supply and Services in the Field Army                    |
| 31-35  | Jungle Operations                                                        |
| 31-70  | Basic Cold Weather Manual                                                |
| 31-71  | Northern Operations                                                      |
| 55-41  | Aircraft Organizational Maintenance Management                           |
| 55-413 | Aerial Recovery of US Army and Air Force Aircraft                        |
| 90-3   | Desert Operations                                                        |
| 100-5  | Operations                                                               |
| 100-10 | Combat Service Support                                                   |

**Technical Manuals (TM)**

|                |                                                                                             |
|----------------|---------------------------------------------------------------------------------------------|
| 5-315          | Firefighting and Rescue Procedures in Theaters of Operations                                |
| 9-243          | Use and Care of Handtools and Measuring Tools                                               |
| 38-750         | The Army Maintenance Management System (TAMMS)                                              |
| 38-750-1       | The Army Maintenance Management System (TAMMS) Field Command Procedures                     |
| 43-0103        | Nondestructive Inspection Methods                                                           |
| 55-409         | Fundamentals of Aircraft Hydraulics                                                         |
| 55-410         | Aircraft Maintenance, Servicing, and Ground Handling Under Extreme Environmental Conditions |
| 55-411         | Maintenance Quality Control and Technical Inspection Guide for Army Aircraft                |
| 55-1500-328-25 | Aeronautical Equipment Maintenance Management Policies and Procedures                       |
| 743-200-1      | Storage and Materials Handling                                                              |

**Department of the Army Pamphlets (DA Pam)**

|       |                                                        |
|-------|--------------------------------------------------------|
| 750-1 | Commander's Guide of Preventive Maintenance Indicators |
|-------|--------------------------------------------------------|

**Technical Bulletins (TB)**

|          |                                                               |
|----------|---------------------------------------------------------------|
| 43-180   | Calibration Requirements for the Maintenance of Army Materiel |
| 746-93-2 | Painting and Marking of Army Aircraft Models 910A and 910AR   |

**Supply Bulletins (SB)**

|        |                                                                                      |
|--------|--------------------------------------------------------------------------------------|
| 708-21 | Federal Supply Classification; Part 1, Groups and Classes (Cataloging Handbook H2-1) |
| 725-28 | Issue of Supplies and Equipment: Regulated Aviation Major Items                      |

**Training Circular (TC)**

|         |                                                  |
|---------|--------------------------------------------------|
| 21-5-7  | Training Management in Battalions                |
| 55-1    | Martin-Baker MK-J5D Ejection Seat                |
| **1-139 | Cargo Helicopter, Air Crew Training Manual       |
| *55-17  | Introduction to Nondestructive Inspections (NDI) |
| *55-23  | Foreign Object Damage Prevention                 |

**Miscellaneous**

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| SOLOG Agreement 75 | Procedures For Repair and Recovery of Military Technical Equipment |
| STANAG 2113        | Destruction of Military Technical Equipment                        |

\*To be published

\*\*To obtain copies, write: Commandant, USATSCH, ATTN: ATSP-TD, Fort Eustis, VA 23604

## APPENDIX B

# SAMPLE INTERNAL STANDING OPERATING PROCEDURES (SOP)

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**PURPOSE**

To provide a standardized guide for maintenance support procedures used in providing maintenance on Army aircraft, aircraft armament, avionics, and related repair parts supply.

**FUNCTIONS**

- Prepares maintenance support plans for new aviation units to be supported and for those relocated from other areas.
- Maintains constant liaison with supported units to insure timely exchange of essential aircraft maintenance information.
- Makes recommendations concerning general maintenance policies and procedures applicable to aircraft, aircraft armament, avionics, and related repair parts.
- Prepares statistical analysis, as required, to accurately depict the status of all maintenance operations to include man-hour expenditures, items and systems repaired, backlogs, and aircraft processed.
- Reviews and analyzes aircraft maintenance reports and statistical data to detect trends and problem areas.
- Determines requirements for contractor technical assistance personnel.
- Provides technical assistance and information to supported units.
- Plans for providing maintenance support for new types of Army aircraft and avionics equipment.
- Provides repair parts and maintenance materials, and recovery and evacuation assistance to supported units.

**RECEIPT OF AIRCRAFT FOR REPAIR**

Policies for receiving aircraft into this unit are as follows:

- All historical records will accompany the aircraft into the shop. Requests received without records will be held until such time as the records are obtained. Of particular importance is DA Form 2408-16 which has critical time-figures of components. Technical inspectors will review the logbook to ascertain if necessary records are present and if time entries are on the form before the work request is taken to the production control officer for acceptance.
- DA Form 2407 will be properly filled out in accordance with TM 38-750. The supported unit will state deficiencies or symptoms of trouble based on the diagnostic procedures outlined in the equipment TM. After the work request has been accepted by the production control officer, the receipt copy of the form will be given to the supported unit representative and the aircraft will be placed in a work status.
- Improper preparation of the DA Form 2407 will not be a basis for refusal of the work request. The production control clerk will give the supported unit representative a blank form and assist in its correct preparation.
- A loose equipment basic issue item list (BIIL) inventory will be accomplished

on all aircraft entered into the shop for maintenance.

- Emergency maintenance service will be provided to any transient aircraft when the service is within the capabilities or limitations of this unit. A DA Form 2407 will be filled out and signed by either the pilot or crew chief. If records for the aircraft are not available, the pilot or crew chief will telephone their parent unit for the required information. A safety of flight inspection will be made by the technical inspection section and the production control officer prior to release of the aircraft.

Aircraft components beyond the unit repair capability will be reported to the backup unit. The maintenance allocation chart (MAC), in the applicable aircraft TM, will be used as a guide in determining the category of maintenance required.

## QUALITY CONTROL

### GENERAL

In general, the quality control section performs the following:

- Inspects aircraft and associated components received for maintenance to determine the need for repairs requested and the quality of maintenance accomplished.
- Schedules and supervises functional test flights in accordance with TM 55-1500:328-25.
- Maintains a complete reference file of technical publications applicable to the unit's operation.
- Prepares and controls equipment improvement reports (EIR) required by TM 38-750.
- Maintains a modification work order (MWO) request file, and requisitions and maintains control of all required kits, parts, etc., until equipment is received for modification. Insures proper reporting of all modifications applied at that level by use of a DA Form 2407. The

quality control officer or other qualified person will be appointed as the weight and balance technician as directed by AR 95-16. Appropriate records will be completed as required by AR 95-16, the applicable operator's manual, and TM 55-405-9.

### RESPONSIBILITIES

The reputation of this unit and the success of its maintenance effort depends to a great extent on the dependability and integrity of the personnel assigned to quality control. All decisions made by technical inspectors must be based on information received from technical publications and as free from opinionated concept as humanly possible to merit the confidence and active support of all maintenance activities.

A concentrated effort to insure research of the latest available information must be evident in quality control operations.

### PROCEDURES

#### Initial receipt.

- When an aircraft is received by this unit on a work request, the work package will be immediately routed to the quality control supervisor.
- A technical inspector will be assigned to the aircraft; he will review the maintenance request to determine faults for which repair is requested and completeness of historical records. He will post the required information to the inspector's assignment board.
- Prior to the aircraft functional test flight, the aircraft historical records will be thoroughly reviewed. The technical inspector will--
- Check DA Forms 2408-13 and 2408-14 for correct entries in accordance with TM 38-750. The aircraft historical records will be thoroughly reviewed.
- Transcribe discrepancies to be corrected from the DA Form 2408-13 to a DA Form 2404. Only direct support (DS) maintenance discrepancies will be corrected unless--

- Organizational maintenance discrepancies will prevent or delay completion of DS maintenance.
- Organizational maintenance discrepancies are red X conditions.
- Discrepancies noted are beyond the capability of the supported organization.
- Workload of this unit is such that the accomplishment of organizational maintenance will not interfere with its primary mission.
- Review DA Form 2408-5 for MWO listed as being current, and check for MWO applied and for proper entries. If the aircraft is the responsibility of this unit for DS maintenance, check the MWO suspense file for any MWO requests that are outstanding and for which kits are on hand or can be otherwise completed. The DA Form 2407 modification request will be returned to production control with the work package. MWO kits, if required, will be delivered to production control.
- Review DA Form 2408-7 and 2408-8 for completeness.
- Review DA Form 2408-15 for unusual entries such as hard landings, crash damage, and other pertinent data.
- Review the DA Form 2408-16 for proper entries as required by TB 55-1500-307-24 and the retirement schedule as listed in the applicable aircraft organizational maintenance manuals (-20 or -23). A separate form will be maintained for time replacement and condition components. A check will be made to insure that time entries are correct. The DA Form 2408-16 serial numbered components will be checked physically against those installed on the aircraft; any discrepancies discovered will be resolved before the aircraft is released for maintenance.
- Review DA Form 2408-17.

- Review DA Form 2408-18 for any inspections due while the aircraft is in maintenance. Any inspection due will be noted on the DA Form 2408-13.
- File logbook on locator shelf.

### ***Incoming Inspections (Initial).***

- The technical inspector will be familiar with TM 55-411 and will perform a thorough and searching inspection prior to entry of the aircraft into maintenance. Technical inspectors will make maximum use of diagnostic equipment available. Engine and systems operational checks will follow the visual inspection if possible. A check will be made to insure that required modifications have been applied.
- All detected discrepancies will be recorded on DA Form 2404.
- All inspections will be conducted in accordance with inspection standards in aircraft maintenance manuals. The technical inspector will have the applicable maintenance manual present when he makes his inspection.
- The technical inspection status board will be posted upon completion of the incoming inspection. Copy number 2 of DA Form 2404 will be removed and filed in the inspection office. The DA Form 2407 work request and the 2404 will be forwarded to the production control office.
- The incoming inspection will be recorded on DA Form 2404 showing time expended.

***In-Process Inspections.*** The assigned technical inspector will keep abreast of the progress, determine serviceability of parts, insure that safety policies are practiced, and be readily available for advice and assistance. The inspector will put his signature in the corrective action blank after the work has been accepted. The inspector will be familiar with every discrepancy on his aircraft, paying close attention to quality maintenance practices.

**Final Inspection.** When all maintenance work has been done, the work package will be routed to quality control by the production control section. The responsible team chief will, if possible, accompany the completed records to quality control. The technical inspectors will--

- Review DA Form 2404 to make sure that all required maintenance has been done and properly documented and all special inspection items have been properly posted; for example, items due retorque, inspection, etc.
- Assist the team chief in properly preparing any required DA Form 2408-10's and insure that the required information is properly posted on DA Form 2408-16.
- Post information as required on DA Form 2408-15. All major repairs that should be made a permanent part of the aircraft's historical records will be posted; for example, crash damage, repairs, engine internal inspections, etc.
- Perform a thorough and searching inspection paying particular attention to the proper completion of all maintenance performed. Any improperly completed work or newly discovered discrepancies will be entered on a DA Form 2404 to be corrected on the spot if possible by the repair team. Discrepancies that indicate negligence or obvious disregard for accepted maintenance practices will be promptly reported to the quality control officer for appropriate corrective action. The final inspection will be recorded on DA Form 2404 with time expended. When all required maintenance has been accomplished, the aircraft will be prepared by the maintenance crew for a functional test flight, if required. If it is determined that a test flight is not required, the team chief will return all DA Form 2404's to quality control. A final review of all historical records will be conducted. All uncorrected discrepancies will be transcribed to the current DA Form 2408-13 and the work package returned to production control for disposition.

### **Functional Test Flights.**

- Maintenance operational checks and functional test flights will be conducted in accordance with TM 55-1500-328-25 and the applicable aircraft organizational maintenance manual (-20 and -23) test flight inspection requirement.
- Functional test flights of aircraft have two important and distinct purposes. The first and most important is to insure that the aircraft is safe for flight and capable of accomplishing its assigned function. This is done through inspection and functional testing of the aircraft and its operating systems in flight. The second purpose is to accurately determine and report the quality of maintenance performed.
- The commanding officer (CO) will designate, in appropriate orders, the flightcrews authorized to test assigned aircraft. Copies of all such orders will be furnished to quality control. The number of crews appointed will be held to a minimum to standardize functional test flights.
- Crew scheduling will be coordinated with the flight operations section. Test flights will be conducted under the supervision of quality control. Functional test flightcrews will be scheduled to preclude delays to the maintenance work schedule.
- Quality control will brief each test flightcrew prior to flight to insure that the crew knows what is significant to the test flight.
- Functional test flight checksheets are guides prescribing format and test flight inspection items as contained in the inspection requirements section of the applicable aircraft (-20) manuals. They will become part of the aircraft's records when completed. Checksheets will not be required if only a few specific items are to be checked. When checksheets are required to check specific equipment or systems, only applicable portions of the checklist will be used. Quality control

will indicate which sections are not applicable for the proposed test flight. All discrepancies will be recorded on a DA Form 2408-13 in sufficient detail to explain the trouble and make possible expeditious corrective action. After each test flight, a thorough visual inspection will be made to insure that discrepancies developed as a result of the test flight will be detected. Discrepancies will be corrected before the aircraft is released for flight. After correction of the discrepancies, all test flight worksheets along with the aircraft logbook will be forwarded to quality control. Quality control will review each completed worksheet and determine the adequacy of corrective action. After completion of all review action, the complete set of maintenance documents will be forwarded to production control.

### ***Technical Publications.***

- Quality control will review each incoming technical publication or other directive affecting its organization to determine application of the document within the maintenance function or to the items being maintained. All directives applicable to that equipment will be immediately posted to the organic equipment's historical records. Particular attention must be given to those publications requiring MWO actions. Production control will be furnished an information copy of this type of publication, or at least be made aware of its existence.
- Periodically, but no less frequently than every 3 months, publication files throughout the organization will be inspected to insure that complete, current publications are in use. At this time, pinpoint distribution requirements will be reviewed and updated if necessary.
- The quality control supervisor will insure that all applicable incoming publications are read by quality control personnel. Inspectors will, during each inspection, determine whether personnel in the maintenance activity are

familiar with pertinent directives and are using them in conjunction with repair actions.

- Quality control will initiate and follow up all correspondence necessary for clarification of technical publications when the intent or requirement is not clear or specific. All recommendations for changes to DA publications, by use of DA Form 2028, will be routed through quality control by the person or section recommending the change.
- Quality control will be responsible for ordering all required publications using the company's pinpoint distribution account system. In cases where required publications are not or have not been initially distributed, DA Form 17, in conjunction with DA Form 17-1, will be used. A card file will be maintained with the following information: publication number, date, title, quantity requested, date of request, for whom requested, if required, date of dueout if received and date received. Each publication center bulletin will be reviewed to determine those items for which a dueout may have been received or a dueout shipped. If receipt of these items does not take place within 30 days of the date of publication, a followup request will be submitted and noted on the file card.

## **PRODUCTION CONTROL AND SHOP OPERATION**

Maximum production of shop and maintenance operations will be established. The uniform flow of the aircraft and its associated components through the shops must be maintained and regulated. Records are processed as repairs are completed or parts removed to reflect a current status of an aircraft and parts under repair. The information originates from the crews and passes by the way of reports to the production control office.

A DA Form 2405 will be maintained in the production control office for all aircraft work orders. Shop platoon clerks will maintain a maintenance request register for all aircraft components routed through the allied shops.

An MWO request register will also be maintained in the production control office.

Request and flow of the DA Form 2407 is as follows:

- Production control clerks will date the request and enter the work request on the production control board. The 2407 and the logbook then pass to the technical inspection section where a technical inspector is assigned who reviews the work package and prepares for the initial inspection. The technical inspector then inspects the aircraft and records all discrepancies noted during the initial inspection. He also reviews and processes data for additional corrective actions as noted below:
  - Discrepancies on DA Forms 2408-13 and 2408-14.
  - Nature of work request, DA Form 2407.
  - MWO requirements.
  - Discrepancies to be corrected are transcribed from the DA Forms 2408-13 and 2408-14 to the 2404.
- Estimates returned to production control from quality control will be evaluated. The production control supervisor notifies the appropriate section chiefs (maintenance and/or allied shops and maintenance officers) of the work assignment. The production control supervisor will estimate a time completion based on work required. Maintenance officers will evaluate current workloads and priorities of work to be done.
- A final technical inspection will be performed on all work accomplished. A runup and test flight are made only after a complete technical inspection is performed and appropriate entries are applied to records. If discrepancies are noted which require extensive or additional work, the aircraft component is returned to the shop foreman and placed back in a work status. Appropriate data and time entries will be monitored and recorded as appropriate.

- Production control will compute total man-hours and cost figures as required and close out work requests on the DA Form 2407 when work is completed. The production control board is posted and the supported unit is notified that the aircraft is ready for pickup.
- The supported unit will sign and date the DA Form 2407, check the aircraft records, and depart with the aircraft.
- Routing procedures are the same for component repair except that usually one man is sufficient to do the work and an intershop work order is used. Distribution and disposition of DA Forms 2407 and 2407-1 will be in accordance with TM 38-750.

The DA Form 2404 is prepared in three copies and distributed as follows:

- The original of the DA Form 2404 is sent to the supported unit along with the blue copy of the DA Form 2407, the logbook, and the test flight worksheet, if applicable.
- The carbon copy of the DA Form 2404 will be filed in the tub file in production control and attached to the work request (buff) for a permanent record of maintenance history of the individual aircraft. Aircraft hours, engine hours, and periodic number (if applicable) will be entered at the bottom of the carbon copy. The second carbon copy will be retained in the quality control file.

## STATUS OF AIRCRAFT IN THE MAINTENANCE SHOP

It is the responsibility of this unit to keep supported units advised of the status of their aircraft while they are in the maintenance shops. A supported unit must have a realistic forecast on the completion date of the aircraft maintenance so it can make firm commitments in operational planning and preparation of reports. Such information is required on a continuing basis and must be reported any time a supported unit requests this information.



A forecast completion date will be phoned to the supported unit as soon as the initial target date has been determined by production control.

Any contingencies arising which force extension of the target date will be explained in detail by phone. A phone call will be made to the supported unit each time the target date is extended for more than 1 working day.

To assist a supported unit in preparing DA Form 1352, Army Aircraft Inventory, Status, and Flying Time Report, the blue copy of the DA Form 2407 will be annotated with the following information: "This aircraft was in direct support maintenance \_\_\_\_\_ days and aircraft not operationally ready supply (NORS) \_\_\_\_\_ days," during the month the aircraft is returned to the owning unit. Submission of this data must be accurate.

### REPAIR PARTS SUPPLY

To improve the efficiency and effectiveness of supply support provided by this unit, the following procedures will be adhered to:

- Accurately report all data for all required reports.
- Consolidate all storage locations where multiple locations exist for the same item.
- Establish a NORS section to provide effective response to supported units on NORS requisitions.
- Walk through requests from supported units if the situation justifies such action. Honor requests for followup (AF1) and requests for status (AS1) from supported units.
- Accept serviceable and unserviceable turn-ins.
- Insure a 100-percent accountability on reparable.
- Perform a 100-percent inspection on all unserviceable turn-ins to insure that all such items are packed, crated, and boxed as necessary for transport.
- Maintain sufficient packaging and crating materials for mission support.

- Insure proper control over parts in transit.
- Strive to achieve the following established performance standards:
  - Maintain at least a 90-percent accuracy in storage.
  - Eliminate double locations in storage.
  - Maintain a minimum 85-percent accuracy between quantity recorded and quantity on hand.
  - Process all requests within 24 hours of receipt. The processing date should be no greater than 7 days older than the unit's document date.
  - Insure expediting of turn-in of excess and nonstocklist items.

### DIRECT EXCHANGE PROCEDURES

Units requesting items for exchange will have on file at the direct exchange (DX) point a properly filled out DA Form 1687. This form must be kept current.

Each separate item will be tagged with DA Form 2402, Exchange Tag, in accordance with TM 38-750.

### TECHNICAL ASSISTANCE

Technical assistance is a command responsibility at all levels of maintenance and supply down to and including this unit.

This unit will provide maintenance and supply technical assistance teams to assist supported units and activities in both maintenance and repair parts supply problem areas.

This unit will provide this assistance to supported units by continuous personal contact and through routine maintenance and supply activities.

To obtain technical assistance, the supported unit must contact this unit stating the nature of requirements, particulars essential to the problem area, and where and when the team is required.

It is not necessary that a supported unit request technical assistance in writing or through official channels. The supported unit should contact this unit either by personal visit, by phone, or by message, whichever is the most convenient. The object of technical assistance is to improve aircraft maintenance and supply systems thereby increasing the aircraft availability rate.

Assistance required that is above the capability of this unit will be referred to higher headquarters for action.

Reports of completed team visits will be submitted directly to the supported unit. They will not be submitted through command channels nor will they be used for disciplinary action. They will be narrative reports and include as a minimum--

- Date of visit.
- Unit visited and its location.
- Team members.
- Key personnel contacted.
- Observations and comments.
- Recommended actions.

Observations, comments, and recommended actions will be given to applicable personnel during the visit. An exit interview will be conducted if practical. A written report of the visit will be forwarded to the supported unit commander as soon as possible. A copy of the report will be maintained in the reporting team's technical assistance file to be used as a reference for future visits.

## TECHNICAL TRAINING

Specialized and technical training is needed for logistical support to keep pace with current developments. On-the-job training (OJT) is encouraged to the maximum extent practical, consistent with maintaining a quality maintenance program.

The need for a timely comprehensive training program must be recognized.

The training program must insure that each individual receives training to develop maximum potential and the highest level of efficiency.

## APPENDIX C

# SAMPLE EXTERNAL STANDING OPERATING PROCEDURES (SOP)

---

**PURPOSE**

This SOP establishes policies and procedures to be followed by supported units when obtaining support maintenance for aircraft and maintenance related functions.

**SCOPE**

These procedures are applicable to all units supported.

**MISSION**

To perform maintenance on Army aircraft, aircraft armament and avionics, and provide related repair parts supply. To provide maintenance assistance teams to supported units and to provide aircraft recovery support.

**GENERAL**

Supported units are requested and encouraged to make use of both telephonic and personal coordination with either the production control officer or the aircraft maintenance sergeant on problems involving provision of maintenance support.

Supported units are requested to follow this SOP in all transactions with this unit. Procedures are aimed at obtaining maximum efficiency and use of personnel, facilities, and equipment.

## TYPES OF MAINTENANCE REQUESTS

Requests for maintenance should be coordinated between the maintenance officer of the supported unit and the production control

officer of this unit. Direct coordination is encouraged so that the supported unit may inform this unit of the type of maintenance to be performed, parts required, time period when the aircraft will arrive for maintenance, mission requirements, and any other information which will aid this unit to provide timely return of aircraft. Coordination between this unit and supported units is stressed.

*A scheduled maintenance request* will be the normal DA Form 2407 requesting maintenance of those defects that have accumulated since the last scheduled maintenance performed by this unit. An initial technical inspection will be performed and all defects noted. Organizational maintenance discrepancies may be corrected by this unit if the maintenance backlog will allow it. It is suggested that supported units provide a crew chief to perform aviation unit maintenance (AVUM) that is discovered during the initial inspection at the supporting aviation intermediate maintenance (AVIM) unit.

*Unscheduled maintenance* will be requested in the same manner as explained above, with the exception of the lead time requirements. Again, if at all possible, direct coordination is encouraged.

*Onsite maintenance* is a service extended to all supported units. The request should be coordinated through the production control section. Onsite maintenance is governed by the extent of maintenance required and the current workload of this unit. It is recommended that onsite maintenance requests be limited to component change and

minor airframe repair. Onsite maintenance will be requested on DA Form 2407.

A *special maintenance request* may be submitted when supported unit operational requirements dictate. Then a specific maintenance defect may be listed for corrective action and all other work except unsafe flight items will be deferred. Unsafe flight items causing a red X condition will be corrected in all instances.

## PROCEDURES FOR AIRCRAFT MAINTENANCE

Personnel submitting DA Form 2407 for aircraft or components will report to the production control office. The following procedures will be in effect and will explain the administrative and inspection requirements in processing a work request.

The supported unit will accomplish the following before arriving at this site.

- All unit discrepancies will be corrected prior to requesting work. (Unit discrepancies need not be corrected if it will result in duplicate maintenance by the mechanics of this unit.)
- The aircraft will be thoroughly cleaned by the supported unit by removing all caked mud, excess grease, oil, and hydraulic fluid from all surfaces.

When the unit arrives the supported unit will accomplish the following:

- Present the aircraft historical records to production control for a complete records check by the quality control section. The supported unit will make corrections found to be necessary.
- A complete basic issue item list (BIIL) joint inventory will be performed by this unit and the supported unit. The inventory checksheet will be signed by a representative of the supported unit. One copy of the checksheet will be retained by production control and one copy will be given to the supported unit representative.
- Serial numbers will be checked to insure that the components installed on the

aircraft and the DA Form 2408-16 correspond.

- A DA Form 2407 will be filled out in accordance with TM 38-750 requesting the specific work to be done.

This unit will accomplish the following:

- A complete safety of flight inspection will be performed by the quality control section, if the aircraft requires a test flight. Upon completion of the safety of flight inspection, safety of flight discrepancies will be added to the DA Form 2407. When the technical inspector estimates the work required on the aircraft to be over 60 percent of the retrograde criteria, a 100-percent inspection will be performed to determine if the aircraft is economically reparable at aviation intermediate maintenance (AVIM) level.
- Aircraft that are found to be retrograde on the acceptance inspection will be handled in accordance with procedures given in TM 750-134, 750-143, and 750-199.

Procedures for aircraft inventory and status reporting follow:

- When the supported unit has an aircraft in the maintenance shop at the end of the month, required information obtained from this unit will be recorded on DA Form 1352, Army Aircraft Inventory, Status, and Flying Time Report, on the first day of the month following the reporting period.
- Aircraft turned into this unit for extensive maintenance for retrograde must have a DA Form 1352-1, Daily Aircraft Status Record, feeder report before turn-in can be effected by this unit. The report will be filled out up to 2400 hours on the day of the transfer.

## PROCEDURES FOR COMPONENTS

The following procedures apply to processing avionics equipment through this maintenance activity:

- All incoming equipment will have a DA Form 2407 work order filled out in accordance with TM 38-750.
- Equipment will be inspected by the appropriate platoon prior to receiving the 2407 and the item. These inspections are to insure completeness and that no cannibalization has taken place.
- Direct exchange (DX) will be made only if the equipment is complete, in accordance with procedures for aircraft maintenance.
- DX will be made with this unit and the defective equipment will be repaired and returned to float stock.
- If equipment is not available for DX, receipt copy number 1 of the DA Form 2407 will be signed and returned to the unit.
- All units will be notified by letter or telephone that the required equipment is ready for pickup.
- If the equipment is not picked up within 30 days, it will be returned to the float stock.

The following procedures apply to armament:

- Armament systems will be processed through this unit's production control section on a DA Form 2407.
- DX items will be listed in accordance with AR 710-2. A listing will be sent to the supported unit by this unit and will be kept current as items are added and deleted.

### RESTRICTED SHOPS

Allied shops, shop supply, and quality control are designed for the exclusive use of this unit. Admission to these shops may be secured only through the production control officer or the aircraft maintenance sergeant.

### ASSISTANCE VISITS

*Assistance visits* will be made by this unit to all supported units. These visits are not designed as an inspection but to acquaint this unit with the problems of the supported unit to extend assistance as needed.

*Maintenance assistance visits* will be scheduled for any unit upon request. Reports of such visits are rendered directly to the supported unit commander and not routed through command channels.

### SETTLEMENTS OF DISAGREEMENTS

If a disagreement develops as to the quality of work performed due to differences in technical inspectors' opinions or for other reasons, the customer will bring such matters to the attention of the production control officer immediately. Customers will not take corrective actions themselves or enter into arguments with personnel of this unit.

If the matter cannot be mutually settled between the production control officer and the customer, the commanding officer of this unit will be notified.

### INSPECTIONS REQUIRED PRIOR TO TURN-IN

This unit will require all removable structural panels to be opened for inspection to insure that there is no trapped water, oil, hydraulic fluid, dirt, spent brass, or other items not an integral part of the aircraft. Special emphasis will be given to the belly panels where dirt and water would easily remain trapped and unnoticed.

A DA Form 2407 will be submitted to the avionics inventory inspection. A copy of the DA Forms 2407 and 2404 stating what components are missing, if any, will accompany the aircraft logbook to the production control section when the aircraft is ready for turn-in.

### EQUIPMENT AND RECORDS REQUIRED FOR TURN-IN

All soundproofing, troop seats, first aid kits, fire extinguishers, and clocks will be installed. Pilot and co-pilot seat assemblies will be loose (not attached to the floor).

All avionics equipment will be installed or a copy of the report of survey (DD Form 200) for missing components will be included in the logbook.

The aircraft data plate must accompany the aircraft. If the data plate is not available due to combat loss, a certificate of loss, in four copies, is required. If a data plate is missing through other than combat loss, a replacement must be requested through channels to US Army Aviation Systems Command (AVSCOM).

An equipment transfer record, DA Form 2408-9, will be filled out in accordance with TM 38-750, except that block 21 will contain the commander's statement of accident or reason for turn-in and be signed by the unit commander.

Entries for the last 6 months on the DA Form 2408-13 are required.

Entries for the last 3 months on the DA Form 2407 are required.

All other aircraft forms, records, and items of equipment listed on the DA Form 2408-17 will be present, or have a statement explaining the reason for loss and show the name of a duly appointed survey officer. They will be signed by the unit commander.

Serviceable components replaced by unserviceable items will be tagged and an appropriate entry will be made on the DA Form 2408-13 and 2408-16.

Prior to transfer of an aircraft, the DA Form 2408-17 will be signed in the appropriate block to indicate that it is current and that all required adjustments have been made.

Permanent removal of property as a result of an authorized change will be recorded as follows:

- Line out the entry.
- Indicate a complete reference authorizing the removal, including the effective date, on the reverse side of the form, the organization removing the equipment and the voucher number of the turn-in.

There must be three blank columns remaining on the DA Form 2408-17.

Items of equipment missing due to combat

or accident damage may be listed on a statement signed by the unit commander, and on which he briefly states the facts surrounding the loss. All recovered items, even if damaged beyond repair, must be available for inventory.

Components and parts removed for tear-down and analysis will be accompanied by a commander's statement citing the control number.

For all other missing items, relief from responsibility as indicated in appropriate regulations is applicable. A list of missing equipment with a statement explaining the reason for loss and the name of a duly appointed survey officer, signed by the unit commander, is sufficient.

If the aircraft is crash damaged, release from the accident investigation board is required in five copies.

A material inspection certificate must be signed by an officer of the losing unit.

DA Form 1352-1 feeder information for the DA Form 1352 will be required. This information will include status through 2400 hours of the day of transfer.

The supporting unit will perform an inventory and serial number check as stated earlier.

## EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR)

Procedures for submitting an EIR are outlined in TM 38-750.

A single EIR will not necessarily cause a reevaluation study to determine if equipment or components should be redesigned. However, repeated EIR submission on the same item is adequate reason to investigate whether an item should be changed. It is therefore necessary to submit an EIR for each equipment failure.

Disposition instructions for copies of the EIR are outlined in TM 38-750.

## APPENDIX D

# GUIDE FOR PREPARATION OF A PRODUCTION CONTROL SOP

---

Following is a guide outline of a standing operating procedure (SOP) for a typical production control element in an Army aircraft maintenance support activity. An annex to the SOP should contain instructions and procedures for customers to follow when preparing their aircraft for input to the support activity. Such areas to be considered, but not limited to, are organization discrepancies, nonessential gear, and loose equipment.

(Organization)

(Station)

Date \_\_\_\_\_

Standing Operating

Procedure Number \_\_\_\_\_

### Section I. GENERAL

#### PURPOSE AND SCOPE

(Generally, the purpose and scope of a production control SOP is to establish scope of operations and responsibilities of assigned personnel.)

#### REFERENCES

(List all references used in establishing and maintaining the SOP.)

### Section II. DUTIES, RESPONSIBILITIES, AND FUNCTIONS

#### PRODUCTION CONTROL PERSONNEL

(Duties and specific areas of responsibilities of personnel assigned to the production control element should be outlined.)

#### FUNCTIONS

(Function of the production control element should be outlined so as to cover administrative areas of--

- Preplanning. (Workloads, workflow, time change component charts, modification work order (MWO) control cards.)
- Coordination. (Supported units; supporting units.)
- Scheduling. (Workflow; production control boards.)
- Costing. (Man-hours; repair parts.)
- Processing. (Aircraft records, files, reports; maintenance requests, in-trashop maintenance requests.)

#### POLICIES AND PROCEDURES

(Policies and procedures to be followed should be established and include, but not be limited to, the following areas of management:

- Customer relations.
- Maintenance priority.
- Organization discrepancies.
- Maintenance assistance visits.
- Technical evaluation of aircraft.
- Nonessential gear and loose equipment.
- Test flights.
- Engine runup and/or taxiing of aircraft.
- Calibration service.
- Cannibalization.
- Recovery and evacuation of aircraft.
- Correlation of repair parts requests.
- Modification work orders.
- Training of maintenance personnel.
- Maintenance of facilities to include fire prevention and safety promotion.)



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## APPENDIX E

# TYPICAL STANDING OPERATING PROCEDURE (SOP), AIRCRAFT RECOVERY AND EVACUATION

---

## PURPOSE

To prescribe recovery responsibility, technique, and procedures for use on Army aircraft.

## SCOPE

This SOP is applicable to all aviation and aircraft maintenance organizations assigned or attached to the US Army.

## GENERAL

Field recovery and maintenance evacuation of aircraft is the responsibility of the supported unit and is further delegated to the organization having maintenance responsibility for the area in which the downed aircraft is operating.

The supporting maintenance organization will provide the necessary personnel, aircraft, and special equipment.

If geographical conditions (such as distance from supported units or intervening mountainous terrain) make recovery by the responsible organization impractical, the authority to perform recoveries may be delegated by the responsible unit to organizations possessing a recovery capability.

Recovery methods are defined and normally performed by the organizations as cited:

- The owning unit maintenance element or its direct support maintenance unit are responsible for flyaways making on-

the-spot repairs or components change within their maintenance capability.

- Evacuation of aircraft with severe structural damage may necessitate using internal loading as well as sling loading. Each recovery presents its own peculiar problems that must be resolved by the recovery officer in charge (OIC). This person is in complete charge of the recovery operation. Airlift recovery will be the responsibility of the supporting maintenance unit.
- Surface recovery is not normally considered feasible in a counterinsurgency type operation. Recovery by this method will depend on the vehicles, road net security, and the tactical situation in the area concerned.

Combat aviation battalions will be called upon to provide the lifting vehicle when necessary. Direct coordination is authorized between the unit battalions and the aviation battalion's operating center (BOC).

Units requesting aircraft recovery will submit the following information to the responsible organization:

- Parent unit organization.
- Name of requestor.
- Type and serial number of aircraft.
- Location of aircraft.
- Extent of damage.
- Air-to-air frequency and call sign.

- Type security in area.
- Where aircraft is to be taken.

The recovery officer will insure that aircraft downed, not as a result of enemy action, are released by aircraft accident investigation boards prior to rigging them for extraction or evacuation, when practical and when the area has been secured.

## RESPONSIBILITIES

### Aviation units--

- Provide for flyaway recovery within their maintenance capability.
- Provide requested information to the supporting maintenance element when recovery support is required.
- Maintain a detailed SOP to include training, equipment, and repair parts required.
- Provide security for the recovery crew. Security will consist of at least one light fire team and ground troops.

### Maintenance units--

- Provide necessary personnel, aircraft, and special equipment.
- Provide recovery support for supported units wherever they are and other units on request when operating within their area of maintenance responsibility.
- Provide necessary guidance and assist in training of personnel of supported units for recovery operations when required.
- Provide written authority to units to whom recovery responsibility has been delegated when geographical conditions make recovery by the responsible organization impractical.

## COMMANDER'S RESPONSIBILITY

Commanders responsible for or actually providing the lift aircraft for evacuation of downed aircraft will report all instances of aircraft being dropped from the lift aircraft regardless of cause. The report will be forwarded to the commanding general or

commanding officer of the organization. The following data will be provided in the report:

- Unit providing lift aircraft.
- Unit owning dropped aircraft.
- Location (coordinates) of dropped aircraft.
- Type, model, series, and serial number of dropped aircraft.
- Type, model, series, and serial number of lift aircraft.
- Injury to personnel or damage to property caused by the dropped aircraft.
- Estimated type and extent of damage.
- Reason or cause for dropping aircraft.

## PRECAUTIONARY, SAFETY, AND OPERATIONAL CONSIDERATIONS

The owning unit of the downed aircraft is responsible for securing the site to include ground and aerial support. Recovery OIC will insure that these precautions are taken prior to attempting a recovery operation.

Night recoveries will not be made except in unusual circumstances and then only with the express approval of the recovery officer's commanding officer or higher authority.

Downed aircraft remaining in an unsecured area overnight may or may not be safe. Security forces and recovery team personnel should be prepared for ambush and the possibility of the craft and area being boobytrapped. Explosive ordnance disposal (EOD) personnel will be employed when the possibility of boobytraps exist.

Maintenance units contacted for recovery support not within their assigned geographical area by one of their supported units will--

- Advise the supported unit of the unit that will recover the aircraft to include call signs, frequencies, and telephone numbers.
- Accept all mission data and transmit this information to the proper direct support company or battalion headquarters.

The lifting helicopter aircraft commander has the authority to discontinue recovery operations at any time he deems the operation to be unduly hazardous to personnel or equipment. This includes authority to jettison the load, if in his judgment damage may be incurred to his aircraft or unsafe condition of flight is encountered.

Normal recovery procedure is considered to be moving the downed aircraft from the crash site to the maintenance facility recommended by the recovery OIC.

## **SAFETY PRECAUTIONS**

Spoilers will be installed on wings and stabilizers of all fixed-wing aircraft recovered by intact procedures, to include appropriate stub sections remaining in the aircraft if the stub constitutes 15 percent of wing surface. Spoilers will be installed on all aircraft, fixed and rotary winged, when sling loaded as independent sections.

Controls of all aircraft will be locked in the neutral or centered positions. This will streamline surfaces and aid in the stability of sling load operations.

Ground crew personnel should wear long sleeved clothing, gloves, and goggles during the period that the lifting vehicle is engaged in the hookup or release operation to prevent injuries incurred by small blown objects.

Ground crew personnel will station themselves away from the downed aircraft during the lift helicopter's approach. Normally the guide will position himself well forward with the remainder of the crew moving to the side of the site least advantageous to the lifting helicopter. The ground crew hookup man will remain on the downed aircraft to expedite hookup. All site considerations equal, the recovery aircraft should always move to its left in the event of an emergency, with the ground crew moving right, if required.

Defueling of aircraft presents a fire hazard in the immediate area that can be ignited with a minimum of hostile action. Defueling is required for weight reduction only. If aircraft are defueled, the fuel will be liberally sprayed with CO-2 and the container closed.

**CAUTION:** Exercise extreme care to avoid contact with JP-4 fuel or water which is contaminated with JP-4 fuel. Personnel coming in contact with either are subject to severe skin burns.

A fabricated static discharge probe will be used by the ground crewmen prior to grasping the hook. If static electricity is not discharged, it may cause injury to personnel or ignite fires because of the sparking action on spilled fuel. Personnel are cautioned to be sure to grab the hook with the hand prior to breaking contact with the probe.

## **WEIGHT AND BALANCE**

Recovery teams should attempt to obtain the weight and balance data of downed aircraft when it is probable that weight reductions are necessary due to the lifting helicopter's payload.

## **SLING LENGTHS**

Sling lengths, as required, are physically prepared by the lifting helicopter crew. Lengths are determined in coordination with the recovery OIC as required by the physical location of the craft, its type and condition, the surrounding tactical situation, point of delivery, and equipment availability. Desired lengths are prepared by various slings with a clevis or link assembly to be dropped to the rigging hookup crew. Rigging crews will use a nominal sling rig length of 6 feet.

## **RIGGING**

All sling loads will be double rigged if possible by the rigging crews to preclude loads from being dropped due to equipment failure.

## **DROGUE CHUTE**

The length of a line securing a drogue chute should be short enough to prevent the chute from reaching the lifting helicopter. This length is determined predominately by the sling length used.

## **DERIGGING**

When possible, the rigging crew will accompany the lifting helicopter to the delivery point to spot and derig the aircraft.



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**FM 55-42**

**29 JUNE 1979**

By Order of the Secretary of the Army:

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*General, United States Army  
Chief of Staff*

Official:

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**DISTRIBUTION:**

*Active Army, USAR and ARNG:* To be distributed in accordance with DA Form 12-11B, Requirements for Aircraft Maintenance Support (non-divisional) (Qty rqr block no. 255).

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| DA PUBLICATION/FORM NUMBER |          |                |        | CHG OR DATE |  |
| FM 55-42                   |          |                |        |             |  |
| LOCATION                   | QUANTITY | UNIT OF ISSUE  | ACTION | RON DATE    |  |
| 550642                     | 1        | EA             |        | 2140        |  |
| PKG SIZE                   | ITEM NO. | BULK/Rcpt DATE | BAGPC  | CONTROL NO. |  |
|                            | 060910   | BLK2146        | 2146   | 10204       |  |

TAGO FORM 4-26 9 OCT 75

